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Editorial.

THE VETERINARY SERVICE AND THE GENEVA CONVENTION.

THAT the Geneva Convention should not protect on the battle-field those whose duty it is to humanely put an end to the sufferings of helpless and wounded animals was probably entirely due to a little want of forethought on the part of those who drew up the articles. Everyone will agree that it is a necessary procedure which ought to be performed by specially trained men; and as, especially during long marches, they are, in the exercise of their duties, bound to be separated from the main body of the army, it is necessary that they should be allowed the adequate protection which is given to non-combatants. Had properly organised bodies, under the protection of the Geneva Cross, been detailed systematically to this work during the recent South African War there is no doubt that very much useless misery and suffering on the part of the poor animals might have been avoided. One would have thought that it would have occurred to the War Office authorities to endeavour to establish this understanding with other nations, but, like many other things of public importance, it seems to have been left to the efforts of private enterprise to endeavour to promote its initiation.

The Church Society for the Promotion of Kindness to Animals

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have made this one of their principal objects during the past few years. Their Secretary has made it his business to interview the President of the Swiss Confederation, the President of the French Republic, and many other influential authorities, all of whom have expressed themselves as favourable to the scheme. The King of Denmark and the President of the United States of America have also expressed their willingness to receive deputations from this Society.

As Veterinary Surgeons we, who are daily in touch with animal suffering, can but give one answer to the question as to whether or not such a course will be beneficial to the poor brutes who are forced to take part in all the horrors of a campaign. Given a staff of men, properly protected by the Geneva Cross and trained to act under the supervision of the Veterinary Officers, it should not be possible for the public at home to read such harrowing descriptions as were given on several occasions by correspondents during our recent war.

On account of the present trouble between Russia and Japan the matter is temporarily at a standstill, but it is intended to give it serious consideration at the earliest possible opportunity.

VETERINARY COLONIAL ENTERPRISE.

DURING the past few years the opportunities which have been opened up in our Colonies for members of the Veterinary profession have increased very rapidly, and there is no doubt that their services are becoming more and more fully recognised and taken advantage of by the Governments. South Africa and New Zealand afford the most noteworthy illustrations. Every year new discoveries are made and valuable reports are given to the scientific world by our Colonial brothers, and the work they are doing is fully appreciated at home.

In many instances their paths lead them into untrodden fields, and the training they have received at home can simply be used only as a groundwork upon which they may build. The post-graduate courses in Veterinary tropical diseases which have been recently established will undoubtedly be followed by all who

intend to proceed abroad. The South African Government has at its command a comparatively large staff of Veterinary officials, some of whom are stationed permanently in certain centres and others whose duties are to go about the country wherever they are sent to investigate outbreaks of disease. That their services are much appreciated by the farmers and other residents is shown by the numerous letters which appear in the Cape agricultural and other journals. It may legitimately be claimed that a great deal of the popularity of the Veterinary service in that country is due to the genial management of the head of the Department, Mr. Duncan Hutcheon, M.R.C.V.S.

In New Zealand veterinary affairs have progressed even more rapidly than in South Africa. Ten years ago a Veterinary Department could scarcely be stated to exist. At the present time Chief Veterinary Officer, Mr. J. A. Gilruth, M.R.C.V.S., is not only the chief veterinary surgeon, but is also the accredited Government bacteriologist, and he has under his control a large staff, the majority of whom are duly qualified graduates of one or other of the British schools.

In that country, at all events, meat inspection is carried out in a proper and scientific manner, and it would be well if our own Government would copy the pattern.

The question of salaries is the only one upon which there seems to be some reasonable ground for complaint, as it is generally understood that in many ways money does not go quite so far towards procuring home comforts and luxuries such as we are used to, but this is a matter which will undoubtedly be remedied when the Government can be got to sufficiently appreciate the high standard of education and the amount of money to be expended before a man can become a Veterinary Surgeon.

THE NATIONAL VETERINARY BENEVOLENT AND DEFENCE SOCIETY.

In the Report just issued by the above Society, attention is again drawn to the benefits which are conferred in all communities by united efforts. Considering the small amount of the

annual subscription and the support to be gained by the individual when in trouble by the knowledge that he has the aid of a powerful society at his back, it is astonishing to read that this association has on its list only 265 subscribing members.

There are over three thousand members in our profession, and certainly over a thousand of these are in a position in which they may be caused considerable expense and annoyance by some contankerous client.

As a general rule, an owner expects a veterinary surgeon to absolutely cure his patient, and if by chance some untoward sequel occurs to an operation, it is quite common for him to dispute the account, or even to present a counter-claim in which he will attempt to prove culpable negligence. Then, again, one has to consider the arbitrary acts of certain societies, such for example as the extraordinary action brought during the past year by the Royal Society for the Prevention of Cruelty to Animals against a North of England veterinary surgeon.

In the words of the Report : "Several important defence cases had been materially assisted during the past year; two charges were brought by officers of the Royal Society for the Prevention of Cruelty to Animals against veterinary surgeons for alleged cruelty. These were strongly defended, with the result that one was withdrawn, paying a certain amount of costs, and the other was dismissed. Several other cases brought before the Defence Society were, very happily, not proceeded with. What a boon and relief must the combined strength of this Society be to any of its members when threatened by law." That a careful and considerate investigation of such cases should be made, advice given, and when necessary able defence provided, all for the annual sum of half-a-guinea a year, should be an inducement to all veterinary practitioners to join, especially when it is further stated that all superfluous funds are utilised in helping the widows and orphans of those (whether they have been members of the association or not) whom misfortune has overtaken; £100 of the funds having been disbursed in this way alone during the past twelve months, and some £200 in defence cases.

NOTES UPON NEARLY FIVE HUNDRED CASES OF ABDOMINAL SURGERY IN ANIMALS.

BY FREDK. HOBDAY, F.R.C.V.S., F.R.S.E., KENSINGTON, W.

(*Continued From page* 26.)

As already mentioned on page 25, one may legitimately divide operations on the abdomen into two great classes, viz. :—

Those in which no actual cutting is required beyond the entrance through the abdominal wall; and secondly, those in which the knife or other instrument is brought into play upon the organs contained in the abdomen.

In the first class may be discussed the practical application and value of simple puncture with the trocar and canula for ascites, laparotomy for exploratory and other purposes, massage of the bowel in cases of obstruction, and the removal of certain foreign bodies from one portion of the bowel to another.

Ascites.

Collection of fluid, often in enormous quantities, in the abdominal cavity is very commonly met with in the dog and cat. In the horse and cow it is comparatively rare. As a rule the liver is cirrhotic or contains tumours, or it may be that kidney or heart trouble are at the root of the mischief. In all animals surgical removal by means of the trocar and canula, followed by a generous diet, and a course of potassium iodide or some general tonic, is the only treatment which offers even a prospect of success.

The operation is simple, the trocar and canula (sterilised by boiling) being inserted subcutaneously for an inch or so through a portion of skin which has been shaved and cleaned thoroughly and then turned into the abdomen. The site chosen in the horse is the left flank, low down and about a foot from the median line; for the cow, the right flank in about the same position. In the dog and cat the median line is infinitely the best place, as there is no muscle here, and there are no vessels to cause hæmorrhage; the best spot to select is about one or two inches behind the umbilicus, care being taken not to injure the bladder (if distended), the liver, or the intestines.

Prognosis is always very guarded and usually unfavourable, but that cases of permanent recovery do occur, and that therefore it is always worth while to attempt an operation, is illustrated by the case of a six-year-old fox-terrier dog recorded by "F.R.C.V.S.," in the *Veterinary Record* for November 12, 1904, and also by the following:—

In April, 1902, after consultation with Mr. Charles Taylor, M.R.C.V.S., I operated upon a French poodle bitch, 4 years old, which had recently developed ascites shortly after rearing a litter of puppies. A large quantity of fluid was withdrawn, and the bitch was put on iodide of potassium twice a day. The fluid showed no signs of recurrence, and the patient made an excellent and permanent recovery, remaining in the same owner's possession for some years afterwards.

This is the only instance out of a considerable number in which the writer has ever seen permanent recovery, although in two others the fluid reformed slowly and the dogs were spared to their owners for several months.

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In another instance, communicated recently to me by Mr. R. Gillard, M.R.C.V.S., a wire-haired fox-terrier, male, aged 4 years, had 1½ pints of fluid removed from the abdomen, and shortly after had more taken away, but eventually made a permanent recovery. In by far the majority, however, "tapping" only gives a very temporary relief, the fluid returning in a quantity sufficient to cause discomfort and distress in about three weeks.

Intra-abdominal injections of iodine or chinosol solution, laparotomy and careful swabbing of the peritoneum with antiseptics after removal of the fluid, have also, in the writer's hands, been of no permanent value.

LAPAROTOMY IN THE DOG AND CAT FOR OBSTRUCTION, DYSTOKIA, ETC.

This operation may be performed merely for exploratory purposes with the object of detecting some obscure disease of the internal organs, for the removal of some foreign body, for the reduction of hernia, or for the removal of the fœtus (or some portion of it) in cases of dystokia.

If done under an anæsthetic and with the strictest regard to antiseptic precautions, provided the patient is reasonably fit and properly prepared, any ordinarily expert operator may open the abdomen without fear.

Laparotomy is always of value to make clear some puzzling condition of the abdominal organs, even if it only demonstrates beyond dispute a condition of things which renders successful surgical interference impossible, and thus enables him to advise the painless destruction of the patient.

For exploratory purposes alone I have used it many times, always with satisfactory results, and it ought certainly to be practised as a routine measure in all cases in which there seems a prospect of affording relief by the introduction of the fingers or the hand into the abdominal cavity.

In four cases of acute gastritis in the dog, which no medicinal remedies appeared to alleviate and for which we could detect no cause, exploratory laparotomy was performed, the stomach and bowels thoroughly explored without tangible result and returned to the abdomen, and to my intense surprise the vomiting ceased immediately, and in each case the patient made an uninterrupted and permanent recovery.

Stones, sharp bones, cords, and other foreign bodies, if of sufficiently small calibre to pass through the bowel, may be moved along the gut and removed *per rectum* after a laparotomy, and the writer has met with several successful instances of this in the dog. It is astonishing how quickly a dog or cat will pick up, if not too much exhausted, when a very irritating foreign body of this kind has been removed without opening the gut.

In obstinate cases of bowel-impaction the hard fæces can, in the dog, be massaged with the ends of the fingers, the hand being introduced into the abdomen, and the concretion mass carefully kneaded from either end to begin with and gradually broken down. This is a much safer operation than one necessitating incision of the gut, although it needs to be done with exceeding care to avoid penetration of the already debilitated and distended walls; it is done with the tips of the fingers, the nails being kept exceedingly short.

For dystokia, when all methods to reach a fœtus or portion of a fœtus, by means of forceps or fingers *per vaginan*, have failed, laparotomy may be performed, and the missing portion normally assisted into the parturition forceps, which have again been passed through the vaginal passage.* This is always worth a trial before resorting to Cæsarean section or hysterectomy. Access to the abdomen is obtained in the dog and cat through the *linea alba*, this being by far the best situation in which to make the incision. The actual site of the incision varies in accordance with the operation to be performed, the range running from opposite the pelvic brim (as in Cæsarean section) to about an inch beyond the umbilicus (as in a gastrotomy). The operation itself is very simple, being merely an incision through the skin down on to the *linea alba* with a sharp scalpel, careful puncture of the peritoneum and a completion of the incision by the aid of a director. In all cases strict antiseptic principles must be observed.

LAPAROTOMY IN THE HORSE (FOR OBSTRUCTION, ETC.).

Laparotomy of the horse, on account of the large and cumbersome size of this animal, must always remain a much more difficult problem than that of the smaller animals, especially when the operation involves manipulative interference with the bowels in a state of disease. Access to the abdomen may be gained through the *linea alba*, the inguinal region, or, in the mare, through the vagina. The latter is especially adapted for the removal of the ovaries, but it is also worth consideration for the removal of bowel obstruction, for massage of the bowel, and for rendering assistance in the removal of cystic calculi. For ovariotomy the author has used this method of entrance more than eighty times in the mare and cow, and can speak with confidence as to the practical value of this method and the infinitesimal risk from peritonitis, if only the principles of surgical cleanliness are observed. In one case, also of calculus of the bowel, the result was so encouraging as to make a further trial worth consideration when an opportunity occurs.

For the removal of calculus I have now had four opportunities of operating. Unfortunately, up to the present none of the attempts have been permanently successful, but two of them in particular gave considerable promise.

CASE 1, which has already been recorded in full detail in the *Journal of Comparative Pathology and Therapeutics* (vol. x., p. 355), occurred in November, 1897, and was undertaken in conjunction with Mr. J. Bell and Mr. Browning, both M.R.C.V.S.

The animal, a cart mare, 9 years old, was taken ill with colic on the 20th, and the pains lasted without much intermission until the 24th, when a rectal examination revealed the large colon to be much distended with material about the consistency of putty, and pitting on pressure.

Laparotomy was performed through the flank, the bowel was well massaged with the fingers, and thoroughly kneaded in a careful manner with the knuckles, and eventually the mass contained in it, although hard and unyielding at first, appeared to give way, and

* *Veterinary Record*, Feb. 4, 1905 ("Proceedings of the Liverpool University Veterinary Medical Society").

became broken up into hard, nobby pieces. Failing to detect any further obstruction, the muscles were sewn up, and the mare allowed to recover from the chloroform.

An hour later she got up, and seemed quite free from pain. Six hours later she ate heartily at some food which was offered to her, and three hours after that (nine hours after the operation) she passed about a quart of soft dung containing three or four hard knobs of fæces. This was the first since the 20th that she had defæcated.

Matters progressed fairly satisfactorily until December 1. On November 29 the appetite had not been quite so good as on the previous days, and the respirations were a little accelerated, but her condition did not give rise to any anxiety. On December 1, as she again seemed in pain, temperature 105° and respiration accelerated, the owner had her destroyed. A *post-mortem* examination revealed a "dust ball," 18½ × 19½ inches and weighing 6 lbs., so situated that it completely blocked up the lumen of the bowel. It was not very hard, being readily cut with a knife, and its exterior could easily be broken into small pieces.

What I anticipate I did was either to break off a number of pieces from its edges and push the dust-ball away from the narrow portion of gut into which it ultimately became fixed again, or else to definitely break down a smaller one behind the large one, and so temporarily allow some fæces to escape into the rectum.

Case 2.—The patient, a black hackney gelding, was taken with colic on Friday, September 2, 1904, and suffered from intermittent pains, which no medicinal agent could permanently relieve, until the 6th. Stimulants (carbonate of ammonia, ether, &c.), sedatives (cannabis Indica, opium, &c.), eserin hypodermically, enemas, hot fomentations to the abdomen, were all respectively tried during the four days and found useless, except temporarily.

On the 6th by rectal examination a calculus could distinctly be felt by palpation on the left side of the rectum at the extreme length of the arm, and it was decided that laparotomy should be attempted, with a view either to the direct removal of the stone through the bowel wall, or, if that was impossible, an attempt should be made to remove the stone from the narrow lumen of intestine in which it was jammed into the large colon, where there would be room for the bowel contents to come past it and where also it must already have lain, without causing serious mischief, for some months.

Under chloroform, and after shaving and using antiseptic precautions, a longitudinal incision was made through the skin, subcutaneous muscles and fat, just between the angle of the haunch and the last rib on the right side, of sufficient size to admit the hand and arm; and without any difficulty a mulberry-like calculus of the "dust-ball" variety, about the size of the crown of a man's bowler hat, was found in the colon, just where the large colon becomes narrowed on its way to the rectum and close under the loins.

Finding it quite impossible to withdraw the piece of bowel which contained the calculus to the orifice of the wound, I slowly worked the calculus itself back into the large colon, as far as I could get it to pass through the semi-solid ingesta which had collected behind it, and left it there.

The peritoneum, muscles and skin were sutured separately with interrupted sutures and the whole covered with iodoform colloid.

The animal woke up from the chloroform free from pain, the appetite returned, and during the same night the bowels acted freely, the fæces being semi-solid like that of a cow.

On the following day the horse appeared to be progressing splendidly, drank water and ate food with apparent relish, although, of course, both were given sparingly. About 5.0 p.m., however, without any preliminary warning, a sudden and violent attack of pain came on and the animal died within about half-an-hour.

Post-mortem examination revealed the fact that the calculus had again been propelled into the old position and, on account of the gangrenous condition of the bowel wall, the latter had become perforated.

The calculus weighed two pounds six ounces, was round, with a mulberry-like exterior, and of the "dust-ball" variety.

Case 3.—November 23, 1904. The patient, a Russian pony, six years old, had been in the owner's possession about twelve months and had occasionally had slight attacks of colic. This time the illness was rather severe and prolonged, and lasted until the 28th, when medicinal treatment apparently succeeded, the bowels acted naturally, and on the 30th the pony left hospital.

On December 1 the animal again appeared in pain, and a rectal examination distinctly revealed a calculus in the colon; this could be felt through the bowel wall.

Laparotomy was performed on the 2nd, but as the bowel could not be withdrawn to the wound and the stone could not be moved into the large colon, a lethal dose of chloroform was administered.

The calculus was round, with mulberry-like exterior, and weighed four-and-a-half pounds.

Case 4.—A Welsh mare, eight or nine years old, was brought into hospital on the afternoon of December 7 with colic. On the morning of the 8th rectal examination revealed distinctly a calculus on the left side of the rectum and situated in the large colon; digital pressure upon it gave great pain.

An attempt was made to force it back into the large bowel, the hand and arm gaining access to the abdomen through a vaginal incision, but, as this entirely failed, assistance was obtained through another incision in the flank. This attempt, too, failed either to raise the affected piece of bowel into the wound or to move the stone, so the patient was painlessly destroyed by pithing whilst under the chloroform.

The calculus weighed two pounds fourteen ounces.

For assistance in administering the anæsthetic and in the last three operations I am indebted to Mr. T. Hodgins, M.R.C.V.S.

Remarks.—The large size of the horse, the enormous weight of the intestine and the awkward situation in which calculi of the bowel are almost always found when they give rise to trouble, make a successful operation for the removal of stone from a diseased large intestine a matter of the greatest difficulty. It would simplify matters very much if the stone was in the small intestine, or indeed even if it was in any portion of bowel, whether large or small, which could be so manipulated that a loop of it could be brought into view outside a laparotomy incision.

There is no doubt that, in any case, early operation, before gangrene has set in, is essential, and in the above cases the diagnosis was made *per rectum* with accurate certainty.

(*To be continued.*)

NOTE ON MULTIPLE FIBROMATA OF HORSES.

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THE term "multiple fibromata" is applied to a class of troublesome tumours with which all veterinary surgeons must be familiar. Appearing first as a small shotty nodule under the skin, generally in the neighbourhood of the muzzle, eye, or sheath (*i.e.*, where the skin is thin and tender), the tumour grows slowly but surely, and while progressing in size, another and yet another tumour of a similar nature makes its appearance in the neighbourhood. Removal of the tumours is only a palliative method of treatment, for they recur obstinately and increase in number, until sooner or later the animal is rendered unfit for use and has to be killed.

While these tumours would appear to be malignant in that they recur after removal, they are generally classified as simple or benign tumours on account of their slow growth, and because they are easily "shelled out" by the surgeon's knife. A true malignant growth, on the other hand, grows more rapidly, while it also infiltrates the surrounding tissues, and consequently cannot be extirpated without removing a large quantity of the normal tissue in its neighbourhood. Yet these multiple fibromata are malignant in more senses than one, and from the surgeon's standpoint they form a link, as it were, connecting the so-called benign with the malignant forms of tumour growth.

A typical case in the horse, for which I am indebted to Professor Williams, and to Mr. Stafford Jackson, M.R.C.V.S., of Liverpool, was carefully examined with a view to ascertaining some of the minute histological details of these tumours. The results obtained correspond with the outward and visible phenomena just mentioned, and to some extent' explain their nature.

Histologically, the cells of a malignant tumour may be distinguished from those of a benign one by paying regard to their method of dividing. In the case of malignant tumours, many of their divisions, as first pointed out by Farmer, Moore and Walker[1], are heterotype, and exhibit a reduced number of chromosomes of a coarse nature, which are ring-shaped or U-shaped according to the stage of the dividing process. Similar divisions occur in the parent sexual cells, and, as I have been able to show[2], they are prevalent in the follicle cells of the ovary. They have been shown by Bonney[3] to be present in ovarian cysts, and the more malignant the cyst, the more common are these heterotype divisions.

In *fibromata*, the figures typical of a dividing nucleus can very rarely be distinguished owing to the compact nature of the tumour and the consequent flattening of the cells. The tumours typical of multiple fibromata in dogs and horses, however, exhibit cells bearing some resemblances to the spindle cells of a sarcoma, and consequently the mitotic or dividing figures are more easy to distinguish. In fact, it is doubtful whether these tumours are not closely allied to the sarcomata, and are composed of similar cells, but of a less primitive type. In the horse examined three divisions only could be found, and one of them was heterotype. This bears out the malignant character of multiple fibromata to some extent.

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It is remarkable that these tumours should be capable, like malignant tumours, of reappearing in remote parts of the body, and yet each of them appears to be encapsuled, in that it can be easily shelled out by the surgeon. It will be noticed, however, that in extirpating these tumours, it is often necessary to cut thin cords that apparently unite the tumour to its neighbours. In order to establish the connection, if any, between one tumour and another, thin slices, about half an inch in thickness and passing through the skin, fasciæ and muscle, were removed from different parts of the animal after death. By staining the slices, any fibromatous tissue could be readily distinguished from the surrounding structures. It was found that those slices which had been taken from a part of the animal far removed from any of the tumours showed no signs of tumour infiltration. On the other hand, in some of those slices that were removed from parts in the neighbourhood of the tumours there could be seen fibromatous tissue surrounding or occluding certain of the small blood-vessels situated in the superficial fascia.

Multiple fibromata, therefore, may be regarded as being semi-malignant tumours, not only from a clinical standpoint, but also from the histological standpoint, for they may exhibit heterotpye mitosis, and they are capable, in a slight degree, of infiltrating the neighbouring fascia by invading the blood-vessels of the same.

These observations, however, are taken from one case only, and are therefore insufficient on which to base a description of this disease. It is nevertheless highly probable that the histological manifestations described in the foregoing remarks, bearing out, as they do, the clinical aspects and symptoms of the disease, will be found to be typical of this condition wherever it occurs.

If seen early enough, it might be possible to remove the whole group of tumours, including the smallest nodules and off-shoots, but it may be safely assumed that the usual practice of removing the largest or the most offensive tumour only, while it temporarily renders the animal fit for use, can never be more than a palliative measure.

REFERENCES.

1. Farmer, Moore and Walker. *Proc. Roy. Soc.*, vol. lxxii., Dec. 10, 1904.
2. De Boinville. *Brit. Med. Journal*, Jan. 7, 1905, p. 13.
3. Bonney. *Arch. Middlesex Hosp.*, vol. iii., 3rd report from the Cancer Research Laboratories.

[NOTE.—Dr. de Boinville's observations are of great practical importance. The tumours he describes might be found in many localities, and their presence raise questions as to the animal's soundness.—EDITOR.]

TWO CASES OF FRACTURE.

BY CAPTAIN W. A. MCDOUGALL, A.V.D., NEWCASTLE-ON-TYNE.

I.—"COMMINUTED FRACTURE OF THE METACARPAL BONE."

A HORSE, belonging to the 130th Battery R.F.A., was kicked on the front of the near fore-leg, about three inches above the fetlock joint, on the afternoon of Saturday, Feb. 4, 1905. As the horse was lame he was at once led back to the stables, where he was attended to by

the Battery Sergeant Farrier. There was a slight abrasion of the skin in front of the canon bone and the farrier considered the injury to be trifling. The leg was fomented, and afterwards a little cooling lotion applied, and a bandage put on.

I saw the horse soon after. He was very lame when moved over in the stall, but could put a fair amount of weight on the injured leg. No fracture could be detected by palpation, but from the lameness shown it was thought that an undisplaced one probably existed. Arrangements were in progress with the object of having him put in slings. Fate decreed otherwise, and he was reported to have slipped in the stable. His leg was then found to be broken and he was destroyed.

Post mortem.—An oblique fracture extending through shaft of metacarpal bone, from three-quarters of an inch above fetlock joint posteriorly, to two-and-a-quarter inches above that joint anteriorly. In the middle third of the bone anteriorly, a triangular piece, about two-and-a-half inches long, had become detached, also a few small fragments round the borders of this triangular piece. Running from the apex of the triangular piece, a crack extended at first upwards and inwards, and afterwards upwards and outwards, terminating on the carpal articular surface of the large metacarpal bone, towards the external part of the joint. Displacement had only taken place in the lower and middle thirds of the bone, in the upper third the fracture only appeared as a crack on the anterior surface.

Remarks.—I think there is little doubt but that the fracture occurred at the time of the kick, and that displacement was caused by something the horse did during the general commotion and excitement which occurs amongst troop horses when "feed" is sounded. I have had not a few cases in which horses have been kicked on parts where there is practically only skin covering the bone, in which the existence of a fracture could only be guessed at, and in which subsequent events have proved that they must have existed from the time the kicks occurred.

II.—"Comminuted Fracture of the Sesamoid Bones."

Some years ago, when on the march with Horse Artillery in the Punjab, a detachment horse became suddenly very lame while cantering along the side of the Grand Trunk Road. On examining him I found he had fractured both the sesamoid bones of one foreleg. The horse was destroyed on the spot, and a *post mortem* made.

Post mortem.—Both sesamoid bones were fractured, and about eighteen fragments of bone were counted.

Remarks.—We had only gone about a mile when the accident occurred, and the horse was very much "above himself" and "playing the fool" after a day's halt. The surface on which the horse was travelling at the time of the accident was dust and sand about fetlock deep.

I think fracture of the sesamoids must be rather uncommon. This is the only case I have met with.

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MESENTERIC ABSCESS.

BY JOHN VARNEY, M.R.C.V.S., WINSLOW, BUCKS.

SUBJECT.—Bay Geld. (Shire), rising six, 17 hands.

October 31, 1904.—Called to attend above animal, showing following symptoms: yellowish white, purulent discharge from both nostrils, slight sore-throat. Temperature 104°, respiration slightly disturbed. M.M. slightly congested. Gave febrifuge-draught, repeated at night; ordered light diet and linseed tea.

November 1.—Much better, discharge practically ceased; appetite much better; repeated above.

November 2 and 3.—Going on well.

November 7.—Horse turned out, and appeared all right and commenced light work.

November 30.—An urgent message came that the horse was very ill and continually in pain.

Upon examination I found the animal was suffering from all the well known symptoms of pneumonia, added to which were symptoms of acute pain, which I attributed to the pleura being involved. The latter caused the animal to break out in profuse perspiration.

Gave Oj. ol. lini, with anodyne and febrifuge draught.

Saw patient at night and found him free from pain; pulmonary symptoms gradually developing.

December 1 to 14.—During this time the lower third of lungs became consolidated; two blisters were applied, and horse gradually began to improve; although temperature was 104°, and attacks of colicky pains (lasting two or three hours at a time) came on every three or four days.

December 14 to January 4.—Animal appeared to be fully recovered from pulmonary disease, and began to maintain his condition; feeds wonderfully well; still temperature 104° and colicky attacks continued, with occasional fits of drowsiness, and staggering gait when moved; but when spoken to sharply would rouse up and go to feed as if nothing had happened.

January 4 to 14, 1905.—Temperature gradually went down, and being 101° F. for a week. Tested him with 3 cc. of tuberculin; got no reaction. Temperature remaining 101° at 6, 9, 12, 15 and 18 hours after.

January 14 to 29.—Animal appeared to be gaining in condition, feeds well, and to a casual observer far from an invalid; but the periodic attacks of colic and drowsiness and staggering continued. It was noticed that there was a considerable amount of jugular regurgitation, and that the second sound of the heart was almost inaudible. The eyes were examined with the ophthalmoscope, but appeared to be normal.

January 29.—A severe attack of acute pain all the afternoon and night. Varied treatment of no avail.

January 30.—5 a.m. Animal quite free from pain.

7 a.m.—Found dead, lying in a natural easy position.

Made a *post mortem*.

Lungs perfectly normal.

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Heart enlarged, but could find no structural valvular disease.

No trace of tuberculosis.

Found an enormous abscess in the mesentery, 1½ feet long, 1 foot wide, and 1 foot in diameter; its walls ½ to 1½ in. thick. Contents: fœtid purulent matter, nearly two quarts.

The abscess was pressing on the diaphragm on the left side, and possibly was the cause of the muffling of the heart sounds.

A third of small intestines attached to it all round; they appeared to cover it up.

Part of cæcum and double colon also adherent, but the lumen of bowel not interfered with, as water poured into small intestine found its way round very quickly; neither could I find any trace of disease in bowels.

Other organs normal.

The liver also was normal, but on the peritoneal surface of middle and left lobe showed indications of pressure, but no attachment.

A LARGE TUMOUR IN THE DOG.

BY R. GRANVILLE HASKELL, M.R.C.V.S., IPSWICH.

THE subject was a middle-aged fox-terrier dog, brought to the free clinique of the Royal Veterinary College in May last. He was in good condition, though rather fat, and apparently suffered little incon-

venience from the growth as far as constitutional disturbance went, but could not lie down on his sternum easily. Although destruction was at first advised, the owner expressed a great wish for an operation, as the dog was a favourite. The tumour hung from the pectoral region, a little on the right of the middle line, though its base extended

towards the left; it was roughly heart-shaped, and almost entirely denuded of hair, the bare skin gradually merging apparently into sound tissue at its base. The surface had a curious bosselated appearance, almost warty. Two or three suppurating spots were noticed, but these, after examination, were merely abrasions from contact with the ground, and did not extend into the depth of the growth. In consistency the tumour was moderately firm; on digital examination it was thought that there was some adhesion between the base and the chest wall. The circumference of the base of the tumour was about eighteen inches. The patient was placed on the table, anæsthetised, and the site of operation cleansed and disinfected. Two incisions were then made, one on either side of the growth, the skin being spared as much as possible. Cutaneous bleeding was readily checked, and it was found that the skin could easily be dissected away from the growth. When we reached the base it was found to be intimately connected with the pectoral muscles and to branch into the axilla. The muscles themselves were distinctly invaded, and a considerable portion of tumour-growth had to be left behind in the arm-pit. The amount of blood lost during the operation was very slight, as the growth itself was poor in vessels, the skin was sutured, and the wound plugged in such a way that it allowed of free drainage. The growth weighed about two and a half pounds, and was on section white, shiny, fairly soft, and apparently made up of areolar tissue and fat.

Unfortunately, a microscopical examination was not made.

The patient was kept under observation, and progressed satisfactorily for about ten days afterwards, but was then unfortunately lost sight of.

CASE OF MENINGITIS.

BY CAPT. BRISCOE KNIGHT. A.V.D., NORWICH.

THE animal was admitted to the Infirmary on January 1, 1905 showing slight signs of vertigo, the movements not wholly under control; he appeared extremely nervous when approached; the pulse and respirations were accelerated; the conjunctivæ injected. On the 2nd, nervous sensibility became more pronounced; when moved round the box the horse stepped in a peculiar way, lifting the forelegs very high, and with a sudden jerk, stamping them down much in the same place, appearing almost as if the cervical and dorsal muscles were affected as in tetanus. Upon pressure along the withers and down the dorsal muscles the horse showed pain and extreme nervous excitability. I then thought there was some injury in this region.

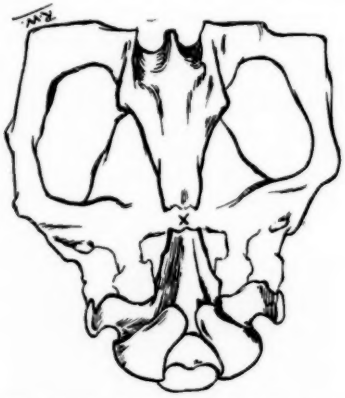
On the evening of the 3rd, horse laid down, appeared in considerable pain, which increased to violent excitement; later relapsed into a semi-comatose condition, but without absolute loss of consciousness. Horse remained in same state all January 4, and died on 5th at 2 a.m.

A careful *post-mortem* examination was made, and revealed no injury whatsoever, no abnormal growth in the brain or spinal cord; the meninges alone were in a high state of congestion.

FRACTURE OF THE BASE OF SKULL IN THE HORSE.

BY G. S. THOMAS, M.R.C.V.S., CHICHESTER.

On April 19 last, I was called to see a five-year-old hunter mare. The owner had ridden the animal up to a sheep-fold two fields from the road and, desiring to examine a sheep which was lame, he dismounted and handed the reins to a shepherd, the mare being outside the fold and the man inside. Whilst he was catching the sheep the mare became frightened and, pulling the shepherd over the hurdle, broke away and galloped down two fields; coming to a gate she attempted to jump, but her pace was too great and she "took off" too late; striking the under side of the top rail with her knees, she landed on her head in the road. When I arrived, I found her lying on her



Under Surface of Skull shewing Fracture (marked x) of the Basi-Sphenoid bone.

right side with blood oozing from her left ear, convulsive twitching of the left eyelid, the pulse 18-20 and barely perceptible, and in a state of absolute coma.

Although there was no external injury to be seen, I diagnosed the case as one of fracture of the base of the skull, with probably depression of the petrous temporal. The animal was pole-axed, and the *post-mortem* examination showed the basi-sphenoid to be fractured, as illustrated in the photograph.

A CASE OF TETANUS IN A COW.

BY PHILIP VINCENT, M.R.C.V.S., GRAYS.

On December 1, 1904, I was asked to look at a cow suffering from a very severe attack of milk-fever. She was delirious, and during her struggles had knocked off one of her horns. Schmidt's treatment was followed, the udder being injected with potassium iodide, and this was followed by a course of strong tonics. The animal made a good recovery, and up to January 8 was giving four gallons of milk *per diem*. We were called in to see her again on that date, as the

attendant said that she had not been feeding well for two or three days. She was in a very nervous and excitable condition, and on trying to administer a draught we had the greatest difficulty in opening her mouth. The next day she was clearly showing all the symptoms of tetanus, the muscles of the neck and jaw being especially affected and very rigid. The day following she was down, and as she appeared in a dying condition we ordered her slaughter.

These notes may be of interest, as tetanus is not common in the cow, and I am wondering whether the tetanus bacillus gained its entrance to the system when the animal knocked the horn off. If so, it would have lain dormant from December 1 to January 8.

PUS IN THE ANTRUM OF THE DOG.

BY FREDK. HOBDAY, F.R.C.V.S., F.R.S.E., KENSINGTON, W.

EVERY now and again one is brought in contact with a case of what appears to be an abscess in the face, a purulent discharge appearing a short distance below the inner canthus of the eye. In the early stages

FIG. 1.—Showing situation of the discharge.

the animal shakes its head, rubs its face on the ground, and shows pain on external pressure. If unfamiliar with the cause the wound is treated antiseptically and will probably heal, but in a week or two the

discharge breaks out again and is as bad as ever. The true cause of the mischief lies in the antrum at the root of the fourth premolar of the upper jaw, and until this is extracted no permanent cure may be expected. Occasionally the tooth behind this has to be removed as well.

Instruments.—A pair of molar forceps, probe, mouth gag, and small syringe.

Operation.—Secure the patient in the abdominal position, shave and cleanse around the wound, anæsthetise with chloroform, and instruct an assistant to steady the head whilst the operator takes a firm grip of the jaw in one hand and applies the molar forceps with the other. The points of the latter are pushed well up under the gums in order to get a good grip, the tooth is loosened by a twist of the wrist and extracted whole. Badly fitting forceps or a slip may cause the tooth to break; the fangs must be extracted if possible, although, so long as there is a communication large enough to admit a probe between the antrum and the mouth, the result is generally satisfactory.

FIG. 2.—Left upper fourth premolar showing result of fracture and inflammation of the fangs. (See text.)

After extraction a probe is passed through from above to below and a good dependent orifice made. When the patient has recovered from the anæsthetic the wound is thoroughly syringed from above to below with some antiseptic solution, and, as a rule, no further treatment is required. In some cases it is wise to use the syringe two or three times a day during the next few days and to keep the wound open, but as a general rule this is not necessary.

The illustration (fig. 2) here shown represents the left upper fourth premolar extracted from a small Welsh terrier, the subject of pus in the antrum, for the sketch and technical description of which I am indebted to Mr. Charles Tomes, F.R.C.S. (author of "Dental Anatomy").

"The crown of the tooth presents nothing unusual and has been exposed to little wear. All three roots show signs of inflammation of some standing and are reduced by absorption consequent upon the inflammation. The outer external root seen to the left of the figure is not much shortened, but its apical portion is thinned down so that it terminates in a sharp point. The antero-internal root, imperfectly seen behind the other in the figure, is more shortened and terminates

in a sharp-edged crater, very characteristic of absorption. The posterior root at the right of the figure is more interesting; it is thinned, shortened and roughened by absorption, and two cracks run across it; the upper one widely open and the lower one with its edges in apposition. These edges have been attacked by absorption, and to some extent excavated and rounded. There is not the least doubt that the incomplete fracture of the root took place weeks and probably a good many months before it was extracted. The probable history is that the dog broke the root partly through in biting a bone and that the irritation caused by the fracture set up absorption, not only in the damaged root but also, to a less extent, in the other two undamaged roots, the periosteum of which may well have suffered minor injury by the wrench. Probably the tooth pulp was killed by, or died subsequently to, the accident, though this cannot be ascertained from the specimen. Its death and decomposition would account for the suppuration above its root."

A CASE OF STRICTURE OF THE SMALL INTESTINE IN THE HORSE.

BY G. S. THOMAS, M.R.C.V.S., CHICHESTER.

On July 16 last an aged roan gelding stopped suddenly in the street whilst at work, and being quite close to my hospital at the time, the animal was taken there. He was in a profuse sweat, and showed evidence of abdominal pain. I administered a draught, consisting of half-an-ounce of methylated ether, one ounce of tincture of opium, and a pint of linseed oil, which appeared to give some relief. In about a couple of hours the pain came on again, and lasted for several minutes.

The carter informed me that whilst coming along the road the animal had passed three or four slimy pellets of fæces on about half-a-dozen occasions, and as he now appeared uncomfortable again I examined him *per rectum*. I found that there was a distinct stricture of this portion of the bowel, and I diagnosed the case, judging from the intermittent pain and the condition of the rectum, as one of stricture of the intestine.

Further treatment consisted of hot-water applications by means of blankets, warm enemas, and subcutaneous injections of morphia and atropin, whilst doses of belladonna were administered by the mouth. The animal died on the 19th, and a *post-mortem* examination revealed a complete stricture of the duodenum extending for exactly 12 feet. The portion of the bowel was so constricted that the finger was with difficulty introduced into the lumen. The rectum was also constricted.

I may also here add that on more than one occasion I have found in cases of stricture of the small intestine that there has been a corresponding stricture in the rectum.

AN INFECTIOUS DISEASE OF OSSEOUS SYSTEM IN THE HORSE.

BY MM. CHARON AND THIROUX.

HORSES and mules in the island of Madagascar suffer from an infectious disease of the bones, that was first noticed during the campaign of 1895, more especially in imported animals, the native breeds appearing to be almost immune. The disease greatly resembled the osteomalacia of Indo-China (*Germain*, a disease amongst Egyptian horses imported into Cochin-China—*Recueil de médicine vétérinaire*, July, 1881, *Ballu;* "Osteo-parosis in Algerian mules imported into Tonkin," *Recueil de mémoires et observations sur l'hygiene et la médicine vétérinaire militaire*, vol. xx., 1899, *Pecaud*; "Osteo-malacia in horses in Tonkin," *Revue générale de médicine vétérinaire*, January, 1904—in this the author expresses his opinion that the disease is infectious). The disease commences with dulness, partial paralysis, and inability to work; the gait is dragging and staggering.

The conjunctiva is injected a bright red colour, but may be of any shade from yellow to brown, and is often studded over with ptechia. In certain subjects there is high fever with quickened pulse and respiration and a metallic heart-sound, the temperature rising to 40° or 41° C. In many cases there is hæmoglobinuria.

The acute form is often complicated with pneumonia, enteritis, congestion of the liver, spleen, kidneys, and spinal cord. In the chronic form paraplegia is a frequent termination.

In other cases the disease takes on an adynamic character, the temperature being 36·4° C. and lower. Some subjects retain all the appearances of health and vigour for a certain time, when obscure lameness, rupture of the attachments of ligaments and tendons and spontaneous fractures take place. The nasal and superior and inferior maxillary bones become softened, causing swelling and deformity of the face.

This deformity is also seen in those acute cases of sixteen to twenty days' duration, but in these the animal has no doubt been for years suffering from the disease in the latent form. The patient gradually loses condition, and the kidneys cease to act properly. There is polyurea, the urine being loaded with phosphates of ammonia and magnesia, urate and hippurate of soda, and oxalate and carbonate of lime. The patient dies in an advanced state of anæmia.

The duration of the disease varies from sixteen to twenty days to a year or more, and animals suffering from the sub-acute are always liable to the acute form. Marked lesions are rare on *post-mortem* examinations, but in certain cases the lungs show the appearances of infectious pneumonia, and the intestines of bilious enteritis.

There is often hypertrophy of the liver, which varies in colour and consistency, *i.e.*, from brick-red to brown, and is hard and sclerotic or very friable. The spleen is also hypertrophied, in many cases to an enormous size, somewhat resembling black currant jelly on section.

The kidneys are sometimes hypertrophied, of a violet or brown colour; sometimes shrunken, of a pale yellow colour, and the suprarenal capsules participate. There is a large quantity of sub-anachroid fluid in the spinal canal, the membranes are injected and vascular, and in

some cases there is a gelatinous œdema round the roots of the nerves. On section of the cord pin-point hæmorrhage is seen round the horns. There is very rarely suppuration or sclerosis.

When the advanced stage of the disease is reached the spinous processes of the vertebræ are so soft as to be easily cut with a knife, being spongy and of a dark red. The aroelar tissue of the maxilla and the dense tissue of the flat bones is softened, the long ones becoming fragile. There is often comminuted fracture and rupture of the attachments of the ligaments and tendons. Most observers have commented upon the poverty in mineral salts of the soil and the insufficient or unassimilable nature of the food as the preponderating cause of the disease; but in a report to the Minister for War, dated 1900, M. Charon dissents from this theory and advances one of its being due to infection.

No doubt the soil of Madagascar is deficient in lime salts, and phosphoric acid, as has been proved by Grandidier, Muntz and others, but the native animals live on food grown on it and do well.

Rice, especially when used unhusked, has been blamed, from its low nutritive properties, being deficient in mineral salts, especially lime ones. Paddy is poor in nitrogen, and animals fed on it are unable to withstand tropical anæmia; its use induces cachexia, alteration in the bone structure, and osteo-malacia.

Chemical analysis, however, shows that non-decorticated rice contains one part of nitrogen to ten of extractives, and mineral salts in the proportion of 0·90 per cent. Compared with maize, rice contains more starch, but less gluten. Braconnat, Berzelius and Liebig give 0·12 to 0·40 per cent. of phosphate of lime.

Shepard, of Charlestown, found that the largest portion of the mineral salts in paddy consisted of phosphate of lime, whereas the straw contained more silicate of potash than phosphate or carbonate of lime; and Johnston, in an analysis of the ashes of both paddy and rice straw, found that the mineral salts were nearly identical with those of the straw and grain of wheat.

Crushed rice has for a long time been the staple food for horses in British Guiana, and crushing has been found necessary, or otherwise the grains are passed whole.

Paddy is the principal grain used for feeding animals in Madagasca, and if it is to blame it is indirectly, and it is the soil which is at fault. The rice which is allowed to remain in the fields during the harvest becomes soiled with mud, and it is frequently fed to animals in this state. The mud, therefore, would appear to be a source of infection, and racing men in Tamatave carefully wash the grain and parch it before use.

The alterations in the bones are not peculiar to that climate, having been observed in France by Cantiget, and Germany by Dieckerhoff, the last of whom differentiated between osteo-parosis and osteo-malacia, and the Madagascar disease has resemblance to both. It seems that the term "osseous cachexia" is appropriate, which term has been applied by M. Moussu to a similar disease in the pig; indeed, the lesions of both diseases have been found in the same subject, both horses and mules.

Certain facts have for some time led the authors to think that osseous cachexia, which is generally attributed to want of phosphates in the food, is really contagious. A horse belonging to the magistrate

of Ankazobe, a district in which this disease was unknown, having been injured, was sent for treatment to the hospital at Fiadiana-Tananarive; he was attacked with the disease in the course of a few days. In 1900-1902, the only cases were those that occurred amongst the mares of the Ampasika stud and the patients in the infirmary at Fiadiana, whereas a breeder on table-land about 90 miles south of Tananarive had never had a single case in his stock.

The latest news from Madagascar appears to confirm its contagious nature. Diseased animals have been isolated, and, as far as Tananarive is concerned, the number of cases has considerably decreased, whereas formerly several stables were notoriously affected.

M. Moussu has proved that osseous cachexia in the pig is contagious, having reproduced it not only from one pig to another, but in other animals, such as rabbits, and he concludes that osseous cachexia of the pig, horse, and ox is caused by the same agent; and, if this is the case, the theory of its production by the soil or food falls to the ground.

Pecaud in Tonkin has reproduced it from the horse to the guinea-pig, and M. Moussu concludes that the material, such as the blood and bone marrow, are only virulent during the acute stages of the disease. This fact may account for others failing to reproduce it.

In preparations of blood Thiroux has found a piroplasma, much resembling the *P. Equi* of Laveran, but they are very few in number, and altogether absent in many cases. The authors publish twelve clinical cases numbered 2, 12, 24, 25, 33, 34, 40, 47, 48, 50, 51, and 53.

Case No. 2.—Camps Anjiajia, Antsiafabositra, and Cascade. Mule, age 11 years.—On August 13, 1895, the animal was noticed to have a swelling over the masseter muscle that according to the attendant was of recent date. There was a large œdematous swelling over the temporal region; also, on August 16, the swelling was smaller, and the maxillary bones, both upper and lower, could be felt.

On the 17th and the following days the temperature fell to 37·5° C., and deep red ptechial patches appeared on the conjunctiva. The back was arched, and the gait staggering; there was great constipation; appetite *nil*, and emaciation took place very rapidly.

On the 18th there was difficulty in breathing, the heart-beats were very violent and audible some distance off, eighty to ninety per minute, and the respirations were fourteen to sixteen.

On the 20th, on account of the camp being shifted, the animal had to be moved, which was done with some little difficulty.

August 21.—Temperature 36·2, rising at mid-day to 38° C.

August 27.—The patient suddenly tumbled over and died without making an effort to rise.

Post-mortem examination was made directly after death. There was great emaciation; the chest and its contents were healthy; the intestines were slightly congested. The head was greatly swollen, especially the maxillary bones, which pitted under the pressure of the finger. When sawn across the cancellated tissue was increased in quantity and tinged with blood. The bony plates of the inferior maxillary bones were separated about two and a half inches from each other.

Case No. 12.—Camp Babay, September 26, 1895. Imported barb 10 years old.—During May and June the patient had suffered from two feverish attacks, but recovered.

On September 26, when being ridden, he suddenly, without any reason, fell lame on the near fore limb, his fetlock almost touching the

ground. He was destroyed with as little delay as possible. The *post-mortem* was made at once.

Both branches of the near fore suspensory ligament were ruptured, the attachments having torn away, with small spicules of bone adhering to them. The inferior sesamoid ligaments were ecchymosed and surrounded with a blood-stained serum exudation.

The cartilage encircling the sesamoid bones was a pink colour, and showed where the rupture of the points of insertion of the ligaments had taken place. The flexor pedis perforatus tendon was partly ruptured, also the perforans at its insertion, and the synovial tissue over the sesamoid bones inflamed.

Case 24.—Tananarive, November 13, 1896. Imported barb, 11 years old. The patient had previously suffered from fever with muscular tremors. He was admitted to hospital on November 1 with fever, staggering gait, the conjunctiva a brick red colour and studded over with ptechia. The case being a hopeless one, was destroyed on November 13.

Post mortem.—Chest and contents normal. The intestines contained a considerable quantity of bile. The liver was of a violet colour, marbled over with yellow patches and very friable. Kidneys of a brown colour. The flat bones and vertebræ were easily cut with a knife, the cancellated tissue being turned into a red or brown marrow. There was a quantity of fluid under the arachnoid membrane and the spinal cord softened in the lumbar region.

Case 25.—Tananarive, November 27, 1896. Imported barb, 9 years old. The patient had been ridden by an officer, and in September, 1896, had suffered from several consecutive attacks of fever. On November 27, 1896, he was destroyed, as he was supposed to be suffering from fracture of the right os calcis.

The *post mortem* was made at once. The calcis was found not to be fractured, but the gastrocnemius tendon was torn from its insertion, a large piece of bone adhering to the ruptured end. The thorax and its contents were healthy. The intestines contained a quantity of bile. Liver slightly hypertrophied and friable. Spleen slightly enlarged. Kidneys softened and coloured yellow.

There was a considerable amount of subarachnoid fluid, and the spinal cord softened at the lumbar region, with some hæmorrhagic points in the left upper horn.

Case 33.—Ampasiku Stud, March 30, 1897. Native mare, 14 years old. The mare had thrown a foal in December, 1896, since which time she had been in bad condition. On March 30, 1897, she was found to be partly paralysed, and for the next three days the temperature varied between 37° and 41° C. Notwithstanding her anæmic condition, the conjunctiva was deeply injected and studded over with patches of ecchymosis. Mouth hot, but moist; ears warm; forehand cold and insensitive to pin pricks.

April 3, the temperature had risen three degrees in a short space of time, and the case appearing hopeless, was destroyed.

The *post-mortem* examination was made at once. The small intestine was full of greenish-yellow bile and the mucous membrane congested. The large intestine partly filled with the *débris* of food and a small quantity of earth. The liver was enlarged, hard, sclerotic, and of a light yellow colour.

The kidneys were yellow, the medullary portion lightest; the

bladder contained a small quantity of thick urine, which deposited a sediment when let stand. The cells of the cancellated tissue were filled with a blood-stained, reddish-brown, gelatinous substance, and all the bones, particularly the dorso-lumbar vertebræ, were easily cut with a knife. There was a large quantity of subarachnoid fluid and the meninges were easily detached from the spinal cord. The white substance was softened and liquefied for sixteen inches in the dorso-lumbar region; in the grey substance were a number of hæmorrhagic points.

Case 34.—Arivonimany, Tananarive, March-June, 1897. Imported barb, 10 years old. The patient had been running loose in a paddock on March 30; he did a journey of sixty kilometres and was somewhat tired, but otherwise in good health. On the 22nd, when brought out of the stable, he had a tottering gait and staggered with his hind quarters, which appeared extremely sensitive on pressure, so much that a saddle could not be put on his back.

The conjunctiva was injected and covered with ptechial patches, temperature 37·2° C. On March 31 he passed bloody urine, at other times it was thick and threw down a quantity of sediment. The pain in the loins diminished and the temperature varied from between 36·8° and 37·5° C.

On May 15 he fell down and was raised with difficulty.

May 20, he became excessively lame on the off-hind, the limb carried extended, muscles of the thigh contracted, and was dragged along the ground, showing pain when any weight was put on it.

No displacement of the patella or crepitation could be detected. There was slight pain shown over the hip joint, but no swelling was ever noticed, and a fracture without displacement, with rupture of the tendons, was diagnosed, and the animal kept tied up till June 5, when a large swelling appeared on the thigh and a fracture of the upper third of the femur was discovered. The animal was destroyed.

Post mortem.—The body was greatly emaciated. There was a great amount of sero-sanguinous infiltration into the internal part of the thigh, with hæmorrhagic patches in places. There was a comminuted fracture of the femur that was of some standing, and the medullary canal was filled with a reddish-brown substance resembling coagulated blood.

On the outside of the thigh the muscles were infiltrated with bloody serum that contained recent clots. They were reduced to a pulp and contained fragments of bone and new-formed calcareous tissue. The trochanter was easily detached from the bone and broke into two pieces. The neck of the femur also was broken and the periosteum on the articular head below the cartilage wanting.

The psoas muscles also were stained with blood and contained hæmorrhagic patches.

The liver was hard, the kidneys sclerotic and a pale yellow. The spinal cord was very hard, but the meninges were healthy.

Case 40.—Analakely, Tananarive, May 2—July 31, 1897. Imported barb, 14 years old. The animal had done good work from 1895 up to the rainy season of 1896-97. He was brought into hospital May 1, 1897, with the following symptoms: Conjunctiva congested and studded over with ptechia, loins painful on pressure, staggering of the hind quarters, blowing, heart-beats louder than natural, pulse 72, temperature 39·8º C. The condition was fairly good. The patient was bled from the jugular vein, a revulsive applied to the loins, and he

was turned loose into an enclosure, when the temperature fell to 37° C. About the twelfth day the patient appeared to have recovered, although the appetite was still poor and the remains of some of the ptechial spots could be seen on the conjunctiva.

On June 22 the urine was tested and found to contain a large quantity of hippuric acid ; complete rest was ordered.

June 30, suffered from an attack of fever, temperature 39·2° C. and conjunctiva injected ; respirations 12, pulse 60 per minute. At noon he fell down, with the hind quarters insensible to pin-pricks. He was got on his legs with some difficulty. There were muscular tremors, lasting for some minutes, and difficulty standing. There was a large quantity of urine passed, thick, pale in colour, and containing a quantity of urates and hippurates of soda.

July 6, suddenly went very lame on near fore ; great difficulty in putting any weight on the limb or remaining standing. The case being hopeless, was destroyed July 31.

Post mortem.—The body greatly emaciated. The small intestine contained a large quantity of bile, the large was nearly empty. The kidneys were sclerotic and pale in colour, but the suprarenal capsules were very soft. The vertebræ were very friable and the flat bones easily cut with a knife.

There was a large quantity of subarachnoid fluid of a yellow colour, and the spinal cord softened from the lumbar region backwards. The near fore limb was carefully examined, but nothing to account for the lameness discovered.

Case 47.—Ampasika, Tananarive, January-July, 1897. Imported barb, 14 years old. The animal had been lame in 1896 on the off fore. He was castrated in March. He suffered from several attacks of fever with staggering gait and the usual symptoms, but the temperature never rose above 39° C. and fell between the attacks. On May 11 and 13 it was 36·4 and 36·5° C. He died on July 5.

Post mortem.—Body greatly emaciated, muscles pale in colour, especially those of the loins. Small intestine contained a quantity of bile, liver yellowish-brown colour, flattened in shape and hard. Spleen enlarged and softened. Kidneys congested. Bones pliable and easily cut with a knife, the cancellated tissue softened and red. The joints were inflamed, containing red-coloured synovia. A large quantity of subarachnoid fluid, the lumbar spinal cord softened and containing a number of pin-point hæmorrhagic patches, particularly round the horns.

Case 48.—Andravohanga, Tananarive, July 9, 1897. Imported Norman, 14 years old. The animal landed at Réunion in August, 1889, Diego-Suarez in May, 1893, and Majunga in April, 1895, and went through the campaign of 1895, remaining in good health till January, 1897, although he suffered from a few slight febrile attacks.

In the early part of 1897 he began to lose condition, and weakness of the hind quarters, which gave way when mounted. In June he had a severe attack of fever, and on July 7 became much distressed with slight work. On July 8 he was found down at noon struggling violently with his fore limbs. The dorso-lumbar region was insensible, the hind limbs rigid and cold, and the rectum prolapsed some four to six inches ; respiration 14, pulse 48 per minute. The case being hopeless, the animal was destroyed.

Post mortem.—Great emaciation. The intestines contained a large quantity of bile. The liver was congested, especially the right lobe, friable and granular, and of a light yellow colour. Spleen enlarged, with two cicatrices on it. Kidneys soft, slightly congested, and of a yellow colour, in places running on into brown.

The lumbar muscles were studded with large hæmorrhagic patches. The third lumbar vertebra was broken into fragments, and the others, both dorsal and lumbar, cut easily under the knife, the cancellated tissue being of a reddish-brown colour. The articular cartilage was a dull violet. The spinal cord was wanting at the third lumbar vertebra for about 1½ inches. At each end the ruptured meninges were adhering like the end of a sausage where tied with the string. The pressure had disintegrated the cord, and when the meninges were punctured the softened contents, which resembled blood-stained pus, escaped in a jet.

Case 50.—Fiadiana-Tananarive, July 27, 1897. Mule, 8 years old. The animal was sent back from a column on July 25, being in such an emaciated condition as to be incapable of working. The urine was tested on July 17, and found to contain a large quantity of hippurate of ammonia, phosphate of ammonia and magnesia, and carbonate of lime. The animal was destroyed.

Post mortem.—Great emaciation. About three quarts of serum were found in the abdomen. The maxillary bones were greatly deformed. A section was made between the third and fourth molars, the transverse diameter of the superior being three inches, and the inferior the same between the fifth and sixth pairs, the horny plates friable, thin, and easily breaking down under the fingers. The cancellated tissue was greatly increased in quantity and of a reddish-brown colour. The flat bones, "scapula and ilium," were easily cut with a knife. The brain and spinal cord were not examined.

Case 51.—Mahamasina, Tananarive, August 5, 1897. Mule, 14 years old. The animal was admitted to treatment on August 5 with œdematous swellings on the chest, under the abdomen, and on the inside of the right thigh. He was in a very bad condition, and unable to work, gait tottering, weakness of the loins, which were sensitive to pressure. Temperature 36·4° C., respiration 12, pulse 68 per minute. During the night both the œdema and paraplegia increased, and the mule died at 6 a.m.

Post mortem.—The body was greatly emaciated. Large œdematous swellings extended under the skin on the chest, stomach, and inner face of the right thigh. The abdomen contained about six quarts of clear, yellow serum. The liver was enlarged, friable, and of a yellowish-red colour. The spleen was greatly enlarged, four or five times its normal size, of a green colour on the surface and covered over with greyish-white patches. When cut it was soft and friable, of the consistency of black-currant jelly.

The kidneys were much enlarged, soft, deeply congested and of a violet colour. The suprarenal capsules were three times their normal size, soft, congested and a violet colour. The vertebræ easily cut with a knife. The subarachnoid fluid large in quantity, and the spinal cord hard and firm. On section in the lumbar region there were dark patches resembling melanosis, but no true melanotic tumour could be discovered on the body.

Case 53.—Amparihibe Tananarive, August 9, 1897. Imported barb,

14 years old. Up to the middle of July, 1897, the patient had only been doing light work and was in soft condition. Since February there had been deformity of the upper maxillary bones. On August 9 he was taken under treatment for weakness of the hind quarters and loss of condition. The deformity of the maxillary and nasal bones slightly increased, but the temperature, respiration, and pulse remained normal.

On August 12 there was a slight rise in the temperature; the urine was examined and found to contain urate of soda, hippuric acid, and carbonate of lime.

During the night of August 14 and 15 there was an attack of fever. On the morning of the 15th the temperature was 39·8° C., pulse 48 per minute, but, curious to relate, the respirations were only 6. There was dragging of the hind quarters and giving of the loins when the hand was passed down the back.

August 25, the condition was much worse, there being great emaciation, but notwithstanding the anæmic condition the conjunctiva was injected, a marked contrast to the pallid mucous membrane of the mouth. The deformity of the nasal and superior maxillary bones had greatly increased. The patient remained standing motionless, and, if made to move, kept the hind limbs wide apart, the fore ones being advanced with difficulty. He was lame on the near fore without any apparent cause, and at every step he threatened to come down.

There were frequent slight attacks of fever, which, however, did not interfere with the respiration or pulse, which latter would run up from 46 to 72 under the influence of the slightest exercise, even moving from place to place at a walk.

On the 27th he fell down and was unable to get up, notwithstanding that he made violent efforts. The urine contained oxalate of lime and urates and hippurates of soda, a small quantity of carbonate of lime, but no phosphates of ammonia or magnesia. The animal was destroyed.

Post mortem. — The body was greatly emaciated. A number of melanotic tumours were found in the substance of the muscles, especially in the upper part of the shoulder and neck.

The liver was very firm in consistency and yellow in colour. The kidneys were double their normal size and the outside surface of a pale yellow colour, darker internally. The super-renal capsules were the same colour throughout their whole substance. There was a large quantity of fluid in the spinal canal, extending out the meninges. The cord was firm in consistency and in the neck and lumbar region the tissue of the grey substance was of a dark colour, but no trace of blood-staining. The vertebræ were friable and the cancellated tissue a dark brown colour. The bones of the cranium and face were soft, and the nasal, and superior and inferior maxillaries greatly altered, the cancellated tissue of the latter being greatly increased, so that the bone was double its normal size; the upper was 2½ inches across at the third and fourth pair of molars, and the lower 2 inches.

The areolar tissue of the nasal bone also was inflamed and the flat one easily cut with a knife. The flexor perforatus tendon was torn from its lower attachment, small pieces of bone adhering to the ruptured end.

(*Recueil de Médecine Vétérinaire*, December 15, 1904.)

ZONA IN THE DOG.

BY PROFESSOR HEBRANT, CUREGHEM VETERINARY COLLEGE, BRUSSELS.

In human medicine the term "zona" is applied to circular eczema or herpes zoster, but it can also equally be used to designate an attack of herpes along the course of a sensitive nerve complicated with neuralgia, and it seems applicable to the case in a dog that is described.

In the human being there are three leading symptoms—fever, pain, and the skin eruption.

The fever is either continued or intermittent, and is accompanied with disorder of the digestive system, and furred tongue, dry mouth, thirst and nausea.

The pain is sometimes most acute, and it also may be continuous or intermittent. It has been compared to a burn or bite, and there is always intense pruritis, more especially towards the evening. It may either precede the eruption, accompany or follow it.

The eruption consists of papules, vesicles or pustules that last for about ten days, when they dry up and disappear. In many cases there is local anæsthesia of the skin.

The locality of zona in the human being is variable. It may appear over any branch of a sensory nerve, and hence it is known under different names, according to the locality it is seen in, such as sciatic, crural, ophthalmic, cervico-brachial, intercostal, and lumbar-abdominal zona, but the term is particularly applicable to the two latter, as the pustules in many cases form a complete ring round the body, and the local lesions are sometimes accompanied with swelling of the neighbouring lymphatic glands.

The etiology of the disease is not well understood. No doubt the immediate cause is irritation of the nerve supplying the part, which may possibly be of a rheumatoid nature.

The case that came under notice was a German basset dog two years of age, that was admitted to the hospital on July 10th with eczema of the left flank that, according to the owner, had caused him great pain and inconvenience. The patch was circular, about 3 cm. in diameter, from which there was a serous exudation that stuck the hairs together. When it dried up the whole of the patch was covered over with small papules, with the hair standing on end.

In addition there was evidently nervous derangement, as the dog would suddenly stand still and stare at his flank, with his eyes wide open and his tail raised like a pointer on game, and then bite the part furiously for a few seconds, after which the pain or irritation would cease.

These nervous symptoms were attributed to the skin irritation, and oxide of zinc ointment, 1 to 10, and a purgative were prescribed, but without success; so belladonna was used in addition, but with no better results. The paroxysms came on with excitement, such as being let loose or returning to the kennel, also at irregular intervals during the night.

Baths were ordered, the patient kept in a quiet dark place, and an anthelmintic given, but no parasites were passed, so with a view of

allaying gastric irritation, it was followed by bicarbonate of soda and Fowler's solution.

On July 20 it was remarked that the dog began to bite and scratch the right flank, although it appeared to be healthy, and the only explanation was that the pain and irritation were due to nervous derangement. On the second day an eruption appeared similar to that on the left side, with the same intense pruritis. The eruption quickly extended towards the umbilicus, and surrounded the body in an irregularly-shaped girdle resembling lumbar-abdominal zona in the human subject. The patient was so irritable that it was impossible to ascertain if the healthy skin between the patches was in the state of anæsthesia that is so common in man.

Being now convinced that neuralgia was present, the treatment was changed to a dressing of salicylate of methyle 1 part, spirit of wine 40 parts, twice a day. After each application the pain seemed increased, the patient biting and tearing the part for about a minute, when it subsided for from six to ten hours, and although not quite satisfactory, it was continued, together with a mild blister down the spine, with a view of counteracting any alteration in the vertebral ganglia, but whether it had any good effect or not is somewhat doubtful.

On July 28 the lesion on the left flank had nearly subsided, and the pruritis disappeared, although it still persisted on the right side, but at the beginning of August it also had vanished, and the patient was convalescent.

The reasons for comparing this case with human zona are that the pruritis preceded the eruption, the belt-like form it assumed, and its intractability, in which it differed from the ordinary eczema that is so common in the dog.

(*Annales de Médicine Vétérinaire*, January, 1905.)

ENZOOTIC IN DUCKS WITH CONJUNCTIVAL DIPHTHERIA.

KAMPMANN, HIRSCHBRUEH, AND LANGE (POSEN).

THE outbreak first appeared in August, 1902, and only attacked ducks, other poultry, such as fowls, guinea fowls, and turkeys, escaping. It commenced in the eyes, the birds keeping their heads continually under their wings.

After a few days there was violent inflammation of the whole of the eye, a turbid yellowish white exudate covering them, together with the beak, and clogging up the nostrils and mouth, gradually increasing in quantity, becoming thick and brown in colour as it dried up. The birds endeavoured to clear their eyes by throwing their heads about. The eyelids were stuck together and ulcers formed on and perforated the cornea, allowing the aqueous humour to escape, so that the eye was destroyed. From these symptoms the authors have termed the disease "purulent neurotic conjunctivitis."

Secondary symptoms followed. The exudate by the movement of the head is scattered over the other parts of the body, chiefly on the wings, and, adhering to the feathers, dries and irritates the skin, giving rise to inflammation, which spreads to the roots of the feathers. The down falls out first, afterwards the wing feathers, the part being bare and covered with hard scales.

The greater the severity of the conjunctivitis the larger is the amount of the exudate excreted, and the eczema is often extended over the whole of the back and back of the neck up to the head. The birds rapidly fall off in condition. At the commencement of the attack they go into the water, but as they get blind they avoid it and remain on a dry spot trying to clear their eyes from the dry exudate. In some cases the upper bill is deformed, so that feeding is impossible. The course of the disease is very slow, running on for several weeks, ending in recovery if the cornea is not perforated. The birds that die are very thin, but, except very slight alterations of the liver, there is nothing to be seen in the internal organs.

The outbreak commenced in the early part of August and lasted into the autumn. It began in young birds, two to three months old, and then extended to the breeding ones. Out of a stock of 240 birds, 100 were attacked; 25 died, 15 were killed, and 60 recovered.

With the winter the disease died out and did not reappear, and in spite of all the poultry being kept together only ducks suffered. This appears to point to their being affected from some spot not frequented by the other birds, such as the damp places on the farm. The whole circumstances seem to point to the disease being of a microbian origin, but its real cause is not known, and the authors have made an exhaustive bacteriological examination of the exudate from the eyes.

This exudate contained numerous micro-organisms, amongst others some short rods and diplococci. Cultivated on serum, a short rod was isolated, much resembling that of diphtheria. It grew on gelose, in the form of a yellowish grey film. On Löffler's serum the rods were larger than on gelose. Babes and Ernest's corpuscules, which are considered to be characteristic of the true diphtheria bacillus, were easily demonstrated by Neissen stain.

The serum culture was then grown on glycerinated agar, but only the diphtheroid bacillus could be detected. These appeared in 24 hours, three distinct sorts of colonies, corresponding with the three different forms of microbes, but possessing the characteristics of the pseudo-diphtheric bacilli. These three different types, A, B, and C, are not always easy to distinguish on agar, but on serum they are most marked. A is of a greyish white, B a pale waxy yellow, C orange. Cultures in broth also differ very little.

The three different forms have all the characteristics of the diphtheria bacillus, taking Gram's stain, being immobile, not coagulating milk or liquefying gelatine, and all three being aerobic.

Although incomplete, this investigation is of interest, as it establishes the fact that a hitherto unknown pseudo-diphtheritic bacillus exists in the eyes of ducks, and that all three varieties produce colour on cultivation.

(*Centralblatt für Bakteriologie*, July 22, 1903, p. 214.)

PARASITIC DISEASE IN CALVES IN THE TEGERNSEE AND MIESBACH DISTRICTS, UPPER BAVARIA.

BY M. CARL GASTEIGER, ZURICH UNIVERSITY.

THE author commences by remarking that there is not much mention of ascarides in veterinary literature, as they have not made their appearance in an epidemic form so as to attract notice.

In the district in which he resides, he has witnessed a regular epizootic that has caused great loss on account of the value of the animals that have died. Although it has been known for the past twenty years, during the past eight it has assumed an endemic aspect, and has excited public attention.

After describing the disease, the author remarks that almost all the calves in his locality suffer from birth to weaning with "pica," or licking disease, and that, although the symptoms shown are not diagnostic of parasites, they explain the mode of infection.

In spite of being affected with "pica," the animals remain in good condition up to about three weeks old, when the first symptoms of the disease are seen. The most apparent is a peculiar smell of the breath, somewhat like chloroform or alcohol, with grinding of the teeth, stamping of the feet, and arching of the back. As the disease progresses there is loss of appetite, colic, tympanitis, constipation, fœtid diarrhœa, renal colic, and the urine pale, with the same smell as the expired air. The urine does not contain bile, albumin, or sugar, and the specific gravity is 1005. There often is fever, followed by gastro-enteritis.

It is useless looking for parasites or their eggs in the excrement, as the first are passed at an early stage, viz., when there is the characteristic smell of the breath, grinding of the teeth, and alteration of the urine; the parasites are passed a few days afterwards.

All these conditions are seen during the third to the fifth week, but in certain exceptional cases they are seen as early as the tenth day and as late as the seventh week.

If the case is not treated it has a variable duration, the parasites being expelled usually in the first, but it may be as long as the seventh week, when the symptoms disappear, but the calf remains in bad condition and does not recover for a couple of months.

The disease assumes two forms:—

(1) A mild form in which the general symptoms described above are shown, with slight loss of condition. The flesh of such cases is fit for human food.

(2) A severe form in which convalescence is prolonged—marked emaciation and symptoms of derangement of the digestive, respiratory and nervous systems. The flesh of such animals is unfit for consumption.

On *post-mortem* examination the parasites are found in the small intestine, particularly in the duodenum, and if the case is a mild one there is no lesion of the intestinal mucous membrane. The flesh has the characteristic smell which disappears by freezing. If, on the contrary, the case is a severe one, there will be symptoms of enteritis and corticular hyperæmia of the kidneys, and the flesh is anæmic and dry, but it does not seem to cause any ill results when eaten.

The author states that the parasite is identical with the Ascaris lumbricoides of man, and is not found in the cow, but the eggs are present in the straw litter and the dirt on both the cow and calf. The animal is infected soon after birth, and this is increased by the habit of licking.

He thinks that the peculiar smell of the breath is due to the acids excreted by the parasites, especially valerianic and caproic. He recommends an emetic and areca nut, with the usual preventive measures in contagious disease, especially the muzzling of the cattle to prevent them from licking themselves. In slight cases the prognosis is good, and even in bad ones, if not too far gone, there are still hopes.

(*Mon. für prak Tierh.*, Band xvi., v. 2, heft 3, bl. 49.)

THE ETIOLOGY OF CONTAGIOUS PLEURO-PNEUMONIA AND ANALOGOUS DISEASES IN THE HORSE.

BY TARTACOWSKY.

ACCORDING to the author, influenza and pleuro-pneumonia are so prevalent in the Russian Army as to have attracted the attention of the authorities of late on account of the confusion that existed between these diseases and their great prevalence amongst troop horses, and efforts have been made to more accurately differentiate them and to determine on preventive measures. In September, 1902, a commission was appointed to inquire into the matter and endeavour to discover a preventive vaccine or serum under the supervision of MM. Trophime and Sokoloff at St. Petersburg.

The author regrets that his observations have not been as extensive as he would have wished, but nevertheless they are valuable; but those as regards influenza are not complete on account of the exceptional high rate of mortality. He gives an historical summary of the history of influenza, or typhoid, as it is known in France and Italy, which is divided into two periods, viz., up to 1881, when it was first seen in Germany and spread in an epizootic form all over Europe. He mentions the writings of Gloag in England; Nauman in Germany, 1803-1808; Spinola, 1840; Gerlach, 1850; and Salke, 1862 (influenza); also the French authors of this period, who described it as epizootic gastro-enteritis, mucus fever, entero-conjunctivitis, and pleuro-pneumonia, as well as Rivolta in Italy, 1873.

Amongst the Russian authors are Bunge, 1847; Prozoroff, 1851; Pachkevich, 1852; and Ravich.

In the second period, from 1881 to 1882, Dieckeroff recognised two diseases, influenza and contagious pleuro-pneumonia; and, in 1881, Konhawser, Lydtin, Friedberger, and Siedamgrotsky.

In France, about the same time, Lavallard, Servoles, Trasbot, Bouley, and Aureggio, wrote on the symptomatology, and Bron, Butel, Delamotte, Joly, Mesnard, Benjamin, Chantemasse, and Cadeac, on its etiology and bacteriology. The first bacteriological experiments in connection with this group of diseases were carried out in 1881 by

Pasteur, followed in 1885 by Lustig of Hanover, Perroncito, Brazzola, Peterlein, Schutz in 1887, Cadeac in 1889, and in 1889-90 Galtier and Violet, "Infectious Pneumo-Enteritis and Diplococcus Pneumo-Enteritis Equi"; Babes, Starcovici, and Calmetta. The disputed question of the etiology of pleuro-pneumonia and equine influenza is treated upon by Lignieres in 1887, which is founded upon Babes and Starcovici's work.

He shows that in both pleuro-pneumonia and influenza that there is a cocco bacillus present belonging to the hæmorrhagic septicæmia group. A peculiar characteristic of Lignieres' bacteria is that it is rare in the dead body, and this explains why Schutz has overlooked it.

It secretes a toxin which renders the organism susceptible to all other microbes, especially the streptococcus of strangles.

Schutz's diplococcus of pneumonia differs from that of contagious pneumonia.

(*Archives du Sciences Vétérinaires*, October, 1904.)

CLASSIFICATION OF THE DISEASES KNOWN AS ACTINOMYCOSIS.

BY J. LIGNIERES AND G. SPITZ.

SEVERAL parasites are capable of giving rise to actinomycosis, as besides the A. streptococcus the authors have recognised four distinct forms, two of which, the actinobacilliosis and actinophytosis, or *Streptothrix spitzi*, have been fully studied.

For a long time only one form of the disease was recognised, although, after the observations of Bostrom and Israel, it was admitted that the parasite was sometimes found in dichotomised filaments and in others in tufts, but without clubs. Granules were also seen with clubs, but without ramifying filaments.

Furant considered actinomycosis characterised by the presence of granules in the central portion formed by the dichotomised filaments, and when these were absent, he termed it pseudo-actinomycosis. Gasperini and Lachner consider all micro-organisms capable of either naturally or artificially developing dichotomised filaments as actinomyces.

Actinomyces would, therefore, according to these authors, be equivalent to streptothrix, and a streptothrix without clubs would give rise to actinomycosis, the term would therefore not be applicable to a disease that was identical clinically, but caused by clubbed-shaped parasites without dichotomised filaments.

Doyen, Coppen, Jones, and others, do not agree with the theory that there is only one parasite that causes actinomycosis, and they even go so far as to maintain that there are different varieties of the streptothrix. It would, therefore, seem that if the term actinomyces is to be adhered to it should be applied to the club-shaped mass, and that the nature of the organism should be specified. In order, however, to

prevent confusion, the authors suggest that the term *Actinophyte*, which indicates the ray shape of the parasite, should be employed, and the disease actinophytasis, in conjunction with that of the specific organism. In the case of trauma, clinically identical with the foregoing, but caused by organisms that do not form ray-shaped tufts, they propose the name of pseudo-actinophytasis.

In order to substantiate their theory, the authors give a *résumé* of the morphological, pathogenic, and culturable characteristics of the two species that have been studied.

1st Group. Actinomysis bovis (Harz), Streptothris actinomycas (Rossi Doria).

Discomyces bovis (Harz and Rivolta), Streptothrix actinomyces (Rossi Doria, Lignieres and Spitz). This is the organism that is considered to be the only one that caused actinomycosis. It has certain specific characteristics, and the experiments have been made with different specimens.

In cultures the streptothrix is in the form of long non-articulated filaments matted together. They generally are very fine, the ends sometimes being bulbar, but usually straight cut. They colour well with Gram's stain, and are non-mobile. In both the cultures and pus there are the granular bodies which also take Gram's stain. Some authorities consider these granulations to be spores, others granular degeneration of the filaments. There are also pseudo-spores.

The streptothrix grows well on the usual culture *media*, and is found in the soil, water, manure, and dust, but by artificial inoculation is not pathogenic, but this and the fact of the frequency of the disease are problems that require clearing up.

2nd Group. (Streptothrix Israeli, Streptothrix Spitzi.) The streptothrix of Wolf and Israel and the Streptothrix Spitzi are possibly identical, and the latter under the microscope is exactly like the Streptothrix actinomyces. The filaments of the S. Spitzi, either free or in club-shaped masses, undergo granular degeneration, but never form pseudo-spores, and there is no afflorescence, as in the first group. The parasite is anærobic and grows at 37° Cent.

The S. Spitzi is non-mobile, and stains with Gram and most aniline colours.

The authors have entered in great detail into the characteristics of cultures of the different varieties on various media.

(*Centralblatt für Bakteriologie*, December 18, 1903.)

TRYPANOSOMIASIS.

BY M. L. PANISSET, ALFORT.

Up to 1880 only one form of trypanosoma was known, viz., Indian surra, but the list has been greatly extended during the past ten years. In addition to surra, a number of different forms of trypanosoma have been recognised in various parts of the world, viz., nagana in tropical, and galziekte in South Africa, mal de caderas in South America, dourine on the southern shores of the Mediterranean, and the horse disease of the Gambia, so that it cannot be denied that the trypanosoma plays an important part in veterinary pathology.

Geographical Distribution.—Since the discovery by Evans of the trypanosoma in the blood of animals suffering from surra, the disease has been recognised in various parts of British India, in Southern China, and the Persian Gulf. In Indo-China, Blin ("Surra in Indo-China," *Revue gen Med. Vet.*, 1903, i., p. 213), and Carougeau (Certain Epizootics in Indo-China, and their Treatment," *Revue gen. Med. Vet.*, 1903, i., p. 685) have recorded its frequency in Upper Tokin, Annam, and Nha Trang. Recently, Montel (De Kermorgant "Surra in Hatien," *Revue gen. Med. Vet.*, 1904, i. p. 548) has seen it in Hatien, on the frontier of Cochin China and Cambodia. It is also reported from Sumatra, Java, and the Philippines, and was introduced by Indian cattle into the Mauritius, but only one case has been reported from Réunion.

Nagana, or *tsetse*, is the trypanosomiasis of Southern and Central Africa, and is found in the valley of the Zambesi, German East Africa, the Camaroons, Belgian Congo, Gambia, Valley of the Chari, shores of Lake Tchad, and Southern Oran. Dourine has a much more limited locality than surra or nagana. It is chiefly prevalent on the northern shores of Africa, and is frequent in Algeria, but has been seen in Spain, Central France and Hungary; also in Java, and has caused great loss in the United States.

The mal de caderas has been studied by Elmassian, in Paraguay, and is confined to South America. It is common in the Chaco, to the north of the Argentine, and in the district of Matto Grosso in Bolivia.

"Galziekte," or bile sickness, which is a separate form of trypanosomiasis, has only been seen in cattle in South Africa.

Species Attacked.—Horses are the most susceptible, suffering from nagana, surra, and mal de caderas; donkeys, mules, and zebras have a greater power of immunity than horses.

Cattle are very susceptible to nagana, but not so to surra. They are entirely resistant to mal de caderas and dourine.

Camels are more susceptible to surra than bovines; the disease progresses slowly, and is known amongst the Arabs as Tei Barsa, or three-year disease.

As far as is known, the diseases reported in camels are identical with Mbori, of Timbuctoo, described by Cazalbou ("Trypanosomiasis in the Camel of the French Soudan," *Revue gen. de Med. Vet.*, 1903, ii., p. 217); Airo, of Central Africa, described by Brumpt; and the Algerian camel disease of Sergent.

In Zululand, nagana is common in the dog, and in Indo-China Blin and Carougeau have seen dogs die from surra. The sleeping

disease of fish, which principally attacks carp, is also due to a trypanosoma.

The Relationship of the Trypanosoma with the other Hematozooa.—The whole of this class of disease which attacks such a number of different animals is due to the presence in the blood of an infusorial parasite of the genus Trypanosoma. They are ecto-globular hematozooa of the group of flagellated protozooa, with undulating membranes.

They appear to belong to a distinct group from the other hematozooa, and, according to a recently published paper by Schaudinn, to form a cycle in the evolution of blood parasites. The spirilla he considers to be bacteria, but that the trypanosoma are forms of the longitudinal division of the endo-globular hematozooa. He also thinks that both the trypanosoma and spirilla are forms in the life cycle of the piroplasma: also that certain forms of this cycle, viz., trypanosoma spirilla and piroplasma, are so small that they will pass through a filter. This leads to the theory that certain diseases, such as human yellow fever and horse sickness, both of which are enzootic in countries where hematozooa are seen, are due to an invisible trypanosoma.

Trypanosoma.—Morphological Characteristics.—The parasite had been seen in the middle of the last century in the blood of fish, frogs, and rats, but its pathogenic nature was first known by the discovery of the Trypanosoma Evansi in 1880, in the blood of animals suffering from surra.

In 1895 the Trypanosoma Brucei was demonstrated to be the cause of nagana. The Trypanosoma Equiperdum, first noticed by Rouget, was demonstrated to be the cause of dourine by Schneider and Buffard, afterwards by Nocard, and Elmassian showed the cause of mal de caderas was the Trypanosoma Equinum. Lately, Theiler ("A New Trypanosoma and the Disease it gives rise to." *Revue gen. Med. Vet.*, 1904, iii., p. 213) has demonstrated the presence of a trypanosoma in the blood of cattle suffering from galziekte in South Africa.

On examining fresh blood from an infected animal under the microscope the red corpuscles will be seen to be violently displaced by the parasite, which presents the appearance of a minute worm provided with an undulating membrane, a long flagella, and exceedingly active in its movements, in some species so much so that it is only with difficulty that they can be kept under the field of the microscope. The parasite can only be studied morphologically when stained; and for diagnostic purposes this is most simple.

A cover glass specimen is made with a drop of blood in the usual manner, dried in the air, and fixed with absolute alcohol; and when this has completely evaporated, a few drops of phenicated thionine or Ziehl's fuchsin or magenta. If the structure of the parasite is to be studied the process is much more complicated, but Romanowski's, Vassilewski or Laveran's methods will give good results, but the colouring matter is likely to be precipitated, obscuring the outline of the preparation. They have been modified by Nocard as follows:—

The films are fixed by immersion for one hour in absolute alcohol, removed, and, after the alcohol has completely evaporated, a drop of the following solution is placed on the corner of the film:—

Hydrochlorate of methyle blue, 1 gramme,
Aqueous solution carbolic acid, 0.5 per cent., 100 grammes,
then 12 drops of Hochst's eosine (extra B.A.) 0.25 grammes,
Distilled water, 1,000 grammes.

The mixture is then floated over the surface and left for from five to eight minutes, well washed with water, treated for at least a minute with Grübler's orange tanin, again washed with water and dried.

The protoplasm of the trypanosoma is coloured a clear blue, the nuclei of the centrosomes violet, the flagella violet. The membrane is sometimes faintly coloured, in other cases it is not. The red blood corpuscles are orange, the nuclei of the leucocytes dark violet, and the protoplasm pink. This method is applicable to the examination of any of the piroplasma of the ox, dog, and sheep.

The Trypanosoma Brucei is taken as the representative type in the following description:—

The parasite measures 25-30 μ in length by 2 to 3 μ in breadth. The posterior extremity is rounded, the anterior elongated into a whip-shaped flagella, which is connected with a folded undulating membrane that terminates near a centrosome, not far from the posterior extremity. This centrosome stains very deeply, and is surrounded by a lighter coloured ring. Scattered through the protoplasm are a number of granules that also colour deeply, and there is an oval-shaped nodule situated in the centre of the body.

Division of the parasite is seen in the blood of animals that are virulently attacked, but in those that have been artificially infected with nagana this division takes place longitudinally, commencing at the centrosome, so that trypanosoma is divided into two halves.

The other species have similar characteristics, and it is, in many instances, impossible to distinguish them.

The Trypanosoma Evansi of surra is very mobile, and is distinguished from the Trypanosoma Brucei by its pointed ends, the body being smaller, the flagella longer, and the granules being fewer in number. The trypanosoma of mal de caderas differs in that the granules are larger and more numerous, the centrosome smaller, and only a very thin reflection of the membrane extending over it. The trypanosoma of dourine, and that of the camel, are impossible to distinguish from the Trypanosoma Brucei.

In the Gambia horse disease, Dutton and Todd ("Trypanosomiasis of West Africa," *Revue gen. Med. Vet.*, 1904, i. p. 546), in addition to forms resembling the Trypanosoma Evansi, found others that were short and thick, the membrane not folded, and the flagella short (Trypanosoma dimorphon).

The Trypanosoma Theileri that causes galziekte, measures from 30 to 65 μ in length, whereas the Trypanosoma Brucei is never more than 35 μ. The flagella is about a quarter of the whole length of the parasite. In addition to the Trypanosoma Theileri, Theiler has found in animals affected with it a second one (Trypanosoma transvaaliense) in which the centrosome is united to the nucleus contrary to what is seen in the other trypanosoma.

Vitality.—The pathogenic trypanosoma have low powers of resistance and infective blood when defibrinated only retains its virulency a few days. At a temperature of 41° C. the trypanosoma is killed in three to four, and at 48° C. in less than an hour. Cold has not so marked an effect, as they can withstand—193° C. for several hours.

All the protozooa are difficult to cultivate, especially the trypanosoma. MacNeal and Novy have, however, obtained pure cultures of

them from the rat, also the Trypanosoma Brucei, and Laveran and Mesnil of the Trypanosoma Evansi. They grow best at 25° C. on gelose and blood, and retain their virulence through a series of cultivations. They will retain their vitality at 37° C. but not their virulency. The trypanosoma has been studied in its native *habitat* by Evans, Bruce, Koch, Schilling and others; also in Europe by Kanthack, Durhan, Bradford and Plimmer in England; and Nocard, Laveran and Mesnil in France.

All animals are easily susceptible to nagana by venous subcutaneous or interperitoneal injection, but the healthy mucous membrane of the digestive system is resistant. In the rat and mouse it assumes a virulent form, killing in three or four days. In the dog there is a preliminary attack of fever, œdema of the genital organs, and death in from ten to fifteen days. It is longer developing in the rabbit and guinea-pig and causes œdema of the genital organs, loss of hair, superficial abscesses and ulceration, ocular troubles and death in about three months. In the ox the parasites may remain for several months in the blood without causing any trouble, but sheep and goats are more susceptible. Œdema and loss of condition are seen, but the disease in these animals is seldom fatal.

In all these animals surra develops in the same way as nagana, but rather more slowly.

The organism of mal de caderas is not so virulent as nagana or surra, the same animals are susceptible, but death is not so rapid.

Dourine is the least active of all ruminants and guinea-pigs are altogether refractory, also monkeys which are actively susceptible to nugana, surra and the Gambia horse disease, and rats and mice are killed with it with difficulty.

The trypanosoma discovered by Dutton and Todd in horses in the Gambia is not so virulent as that of nagana, rats and mice not dying for from three to four weeks after inoculation.

Human beings are refractory to the trypanosoma of animals, being known in the former only in West Africa, whereas in the latter it exists in many parts of the world. Inoculation has enabled the West African trypanosoma to be differentiated from Dutton and Todd's in horses, which latter appears to be the most virulent.

Natural evolutions.—The presence of the trypanosoma in the blood of infected animals and the results of the inoculation of divers species, together with the clinical study of the symptoms of the various diseases, nagana, surra, mal de caderas, dourine, &c., has enabled the different varieties of the parasite to be clearly recognised. All these diseases are characterised by an incubation period, accompanied with remittent or intermittent febrile attacks, progressive anæmia and emaciation, œdema, particularly of the hind limbs and genital organs, and in the later stages paralysis. A curious feature is that the appetite remains and the chief functions of the body are not interfered with.

The special symptoms of each of these diseases permit of their recognition. Surra develops slowly, the intermittent febrile attacks last for a considerable period, and at times no trypanosoma are present in the blood, or during the periods of apyrexia, and at the commencement there is urticaria, which appears to be a special symptom of this disease.

In nagana the eye suffers from œdema and ulceration of the cornea, ending in blindness.

XUM

In mal de caderas there is difficulty in moving, with paralysis of the hind limbs from commencement, and hematuria is almost always present.

In dourine there is œdema of the genital organs in both sexes, with patches on the skin which are diagnostic of the disease. They appear suddenly, and disappear with equal rapidity, sometimes in a few hours, but they never remain for more than from six to eight days.

In the Gambia horse disease its development is very slow and œdema is seldom seen.

Lesions.—The *post-mortem* appearance of animals that die from different forms of trypanosomiasis are neither specific nor constant. All the tissues are anæmic and infiltrated, the serous cavities being filled with a yellow-coloured exudate, and the subcutaneous and intermuscular connective tissue with fibrous coagula. The marrow is red and softened. The internal organs are but little changed except the spleen and lymphatic glands. The first is enlarged, hard and firm, but in some instances soft and friable, and the glomerules stand out very distinct in a section, the lymphatic glands are enlarged and often hæmorrhagic. Nervous lesions have only been noticed in dourine, and, according to Marek, these are most noticeable at the trunk roots.

Natural Spread of Trypanosomiasis.—Kempner, Rabinowitch, Laveran, and Mesnil, have shown that the trypanosomiasis of rats is propagated by fleas. The intermediary agent in the spread of nagana is the tsetse fly (Glossina morsitans and Glossina pallidipes, of Zululand; Glossina palpalis, of the Congo; Glossina decorsei, of Lake Tchad and the Chari; and Glossina longipennis, of Somaliland). The part played by the fly is well known to travellers, and it has been experimentally proved by Beuer, that it transports the parasite and inoculates the animal with it. When a fly stings an infected animal the trypanosoma adheres to the interior of the proboscis, and, when it again stings a healthy animal, inoculation takes place. The puncture is only dangerous for forty-eight hours after the infected animal has been first stung, after that time the adherent trypanosoma dies. Big game in Central Africa are often infected with nagana from the tsetse sting.

The tabanides (Tabanos tropicus and Tabanos cineola), are accused of conveying the surra parasite, and the experiments of Rogers in India, and Montel at Hatien, appear to confirm this. Musgrave and Clegg, in the Philippines, have discovered the trypanosoma of surra in the blood of rats, and no doubt these animals act as hosts for the parasite.

Sivori and Leclerc appear to have been able to transmit the mal de caderas with the stomoxys (Stomoxys calciterans) that had previously bitten infected animals. Lignieres and Elmassian have recognised the trypanosoma in the abdomen of the stomoxys, but have not been able to prove the part the fly takes in propagating the disease.

In addition to the diptera, the hippobosca (Hippobosca rufipes and hippobosca maculata) must be mentioned, both of which convey the trypanosoma that Theiler has discovered in bovine galziekte in the Transvaal. (The two hippobosca of the Transvaal that are capable of conveying the Trypanosoma Theileri, *Revue Generale de Med. Vet.*, 1903, ii., p. 68.)

Dourine is only seen in breeding animals, and appears only to be propagated by the act of coition. But Rabinowitch and Kempner

(*Revue Generale Med. Vet.*, 1903, ii., p. 659) are of opinion that although this means of contagion is the most common, that it can also be transmitted by insects. These authors think that dourine is only a clinically different form of nagana or surra, and is conveyed in the same manner.

The diseases caused by the trypanosoma have a great resemblance to each other, viz., in clinical evolution and mode of transmission, and the organisms which give rise to them are evidently very closely allied to each other, and the question arises if the names surra, nagana, caderas, dourine, &c., are not applied in the same disease or varieties of the same. Nocard, Laveran, Mesnil and Lignieres, have studied this question and proved that they are all distinct.

Dourine clearly differs from all the others by its symptoms, and mode of propagation, and Nocard has shown that dogs which have a high degree of immunity against dourine, are most susceptible to nagana. Lignieres has also demonstrated the susceptibility of dogs to mal de caderas and their immunity to dourine.

In surra, nagana and mal de caderas, the difference in the length of evolution and symptoms are sufficient to show that they are not the same, although no doubt they are very analogous. There are the morphological distinctions that are always present, which have already been mentioned regarding the Trypanosoma Evansi, Brucei and Equinum, although this of itself would not be sufficient evidence, but again there is a further proof, as animals can be affected with one that resist the others. For instance, goats and sheep that have been rendered immune against nagana are as sensitive to mal de caderas as unprotected animals. (Laveran and Mesnil, "Nagana, Surra and Mal de Caderas, as three Distinct Diseases," *Revue Generale de Med. Vet.*, 1903, ii., p. 69), and the same is seen in the ox "*Salted*" to nagana, which is quite vulnerable by Surra. (Nocard Vallée and Carré, "The Relationship between Surra and Nagana and Nocard's Experiments," *Revue Generale de Med. Vet.*, 1903, ii., p. 471.)

It therefore can be reasonably concluded that there are a multiplicity of enzootics of trypanosoma in different parts of the world, which, although they have a number of points in common, are nevertheless quite distinct from each other and give rise to quite different manifestations. There is also no reason shown why the number of trypanosoma enzootics is not indeed larger in number, and that the African ones could not be further subdivided, or, on the other hand, why a number of these diseases that are now classed as distinct ones should not ultimately prove to be identical. Vallée and Panisset ("Reports on Surra and Mbori," *Comptes Rendas Ac. des Sciences*, Nov. 22, 1904) hold strongly to this opinion and show that animals that are immune against surra cannot be affected with mbori, from which they conclude that the trypanosoma of mbori is identical, or, at all events, closely allied to the Trypanosoma Brucei.

Diagnosis.—Outside the region in which it is naturally found, the diagnosis of disease caused by trypanosoma is difficult, as there are rarely any pathogenic symptoms, those present being anæmia, irregular febrile attacks, and emaciation, although the appetite remains good.

The organism should be looked for in recent œdematous swellings, and in the blood during the febrile attacks, and this repeated on several consecutive days. The organisms are difficult to discover; sometimes only one will be seen in three or four preparations.

Experimental diagnosis can be carried out by inoculating the dog, as this animal gives a characteristic reaction with the different varieties of trypanosoma : a few cc. of blood, or, better still, the serum from an œdematous swelling, is injected subcutaneously, and on the sixth to the eighth day there is a rise in the temperature, a hot and painful swelling at the point of inoculation, with œdema of the genital organs. This is followed by loss of condition, difficulty in moving, defects of vision, followed by death in a shorter or longer period according to the nature of the disease.

Prophylaxis.—Modern commerce and rapid transit have a tendency to spread all epizootics beyond their original area, and amongst others the trypanosoma with which the islands of Réunion and Madagascar are threatened.

The demonstration of the existence of trypanosomiasis in camels in the neighbourhood of Timbuctoo, and the discoveries by Dutton in the Gambia, have shown the danger of infection from West Africa, through the agency of caravans from those regions bringing infected animals into Southern Algeria and Tunis.

Szewczyck and Rennes ("A North African Trypanosoma," *Revue Generale de Med. Vet.*, 1904, iii. p. 58) have, under the name of "mal de zousfana," described a disease due to a trypanosoma in the extreme south of the province of Oran, which appears to be nothing else than nagana, and there are strong suspicions that it has been imported by a caravan from the neighbourhood of Timbuctoo. This would tend to prove that in addition to dourine, which is known to be prevalent, there are other diseases due to trypanosoma, and that the health of the colony is in danger from Central Africa.

The existing sanitary regulations are sufficient to cope with dourine, which, from the peculiar method in which it is propagated, is easily contracted, all stallions being carefully inspected, and those suffering from the disease either destroyed or not used for breeding purposes.

As regards the other forms, the most general preventive means adopted are to guard against the stings of the flies. Amongst various devices that have been advocated are keeping the animals in an atmosphere of smoke, applying a greasy dressing, such as oil or vaseline, the use of special clothing, and only to work during the night when there are no flies about ; also to only use dark-coloured animals, as not being so liable to be attacked by flies ("Coleman Nockold's Statistics as to the Colour of Animals Attacked with Surra," *Revue Generale de Med. Vet.*, 1903, i. p. 92).

The introduction of trypanosoma into non-infected localities may be prevented by stringent regulations regarding the importation of animals. Nocard and Laveran propose that all diseased animals should be immediately slaughtered, and suspects carefully isolated in a place inaccessible to flies until a diagnosis is arrived at. In certain cases they would prevent the importation of oxen from the infected region.

Treatment.—Up to the present, treatment has been of little avail, although various drugs, such as corrosive sublimate, iodine, iodide of potash, methyll blue, &c., have been advocated. Arsenic, although it has not effected a cure, has no doubt prolonged life, and caused some improvement. Recently Ehrlich and Shiga ("The Use of certain Colouring Materials in Trypanosomiasis," *Berliner Klin. Wochenschrift*,

March 28 and April 4, 1904) have obtained good results with benzo purpurine and sulfoconjugæ. Laveran ("The Use of Trypanroth in certain Diseases caused by Trypanosoma." *Comptes rendus Ac. des Sciences*, vol. cxxxix., July 4, 1904) states that trypanroth has been of service in mbori and surra in mice. In rats trypanroth, in conjunction with arsenic, seemed to effect a cure; it appears to be worthy of further attention.

The same author has observed that human blood serum has a bactericidal action on trypanosoma, and that, if infected animals are inoculated with it, the parasites rapidly disappear from the blood, but reappear again a few days later, and that if the process is repeated, life is prolonged for a considerable period, although a cure is not effected. Laveran ("The action of Human Serum on the Trypanosoma of Surra, Nagana, and Mal de Caderas." *Revue Generale de Med. Vet.*, 1903, ii., p. 307).

Animals that recover from one attack of nagana, no matter how slight it may be, are immune to a second one, and attempts have been made to carry this out by artificial means.

Koch and Schilling (Report on "Surra in the Ox and Horse in the Protectorate of Togo," *Revue Generale de Med. Vet.*, 1903, i., p. 214) have endeavoured to attenuate the virulence by passing the parasite through different species of animals, and claim to have had good results.

The facts mentioned are, however, not conclusive, as other observers have found that, although no doubt the trypanosoma do become attenuated in their passage through the bodies of such animals they recover their original virulency when again inoculated into one of the same species that they originally were obtained from.

At present there is no practical medicinal treatment for these diseases known, and evidently there is a vast scientific field yet to explore.

(*Revue Generale de Medecine Veterinaire*, December 1, 1904.)

BEHRING'S METHOD OF ANTI-TUBERCULAR VACCINATION.

BY M. J. B. SCOFFIE, NICE.

At a meeting of the Academy of Sciences of Stockholm, held December 12th, 1901, Professor von Behring, of Marbourg, announced the discovery of a new method of rendering cattle immune to tuberculosis, which he termed *anti-tubercular Jennerisation*, which was obtained in young animals by intravenous injection of human tubercular virus. ("Von Behring le Jennerisation comme moyen de prevention de la tubercular bovine," *Revue Generale*, 1903, vol. 1, page 86).

Dr. Schweinitz in 1894 and Schweinitz and Schroder in 1896, demonstrated that cows tolerated intravenous injection of attenuated cultures, and MacFadyean, in 1901 and 1902, showed that cows that had been subjected to a series of virulent inoculations had high power of resistance to tuberculosis, and Thomassen ("L'immunite des jeunes bovides contre la tuberculose," *Revue Generale*, 1903, Vol. 1, page 208), showed that intravenous inoculation with small doses of human tuberculosis acquired it in a like manner.

After numerous experiments, Behring adopted for the vaccination

of young animals a culture of human tuberculosis that had been kept in his laboratory for some years. This cultivation, which was very attenuated, was injected in five-milligramme doses into the jugular vein, and a few weeks afterwards repeated in double quantities and gradually increased up to thirty centigrammes without causing any ill effects, whereas the same cultivation commenced in two centigramme doses gave rise to serious accidents.

Animals that were able to resist these increasing quantities of human tuberculosis were able to withstand a dose of the same of bovine origin that rapidly destroyed non-vaccinated control animals.

Von Behring, however, found virulent nodules on *post-mortem* examination in a subject protected against bovine tuberculosis, and caused him to modify the process (*Beiträge zur experimentellen Therapie*, vol. 8, 1904).

The first inoculation is made with a dose of four milligrammes of human tubercular culture on glycerine and serum, dried in a vacuum, or twenty milligrammes of fresh culture, but in degree of virulence only representing two milligrammes. These four milligrammes are diluted with a one per cent. solution of chloride of sodium and injected into the jugular of calves from three weeks to three months old. The second vaccination is performed about three months after the first, the dose being multiplied five-fold *i.e.* 100 milligrammes of fresh or 20 of dried culture. Pearson and Gilliland ("Quelques experiences sur l'immunisation du betail contre la tuberculose," *Revue Generale*, vol. i., page 459, 1903) recognise the immunity given to cattle by the intravenous inoculation of human tuberculosis and that larger doses than are necessary to give a high degree of immunity can be given to young animals without any danger. They are carrying out some further experiments with the object of determining the degree and duration of immunity that is conferred.

Drs. Schweinitz and Schroder ("Epreuve de la resistance à la tuberculose du bovide traite," *Revue Generale*, 1904, vol. iv., page 175) have shown that a cow that had been inoculated with human tuberculosis and placed in a highly contaminated place remained immune, but when slaughtered some months after a number of small nodules were found in the lungs containing the bacillus, and which reproduced the disease in the guinea pig. In all probability these were of human origin.

Professor Schlegel (*Revue Generale*, December 15th, 1904, vol. iv., page 664) has tested two animals that had been rendered immune by Von Behring, but the results are not very conclusive. They received an intravenous injection of 33 milligrammes of bovine tuberculous material and withstood it better than control non-protected animals, but they reacted to the tuberculin test; and in one animal, on *post-mortem* examination, tubercles that contained active bacilli were found in the lungs and right kidney.

The experiments of Lorenz, of Darmstadt (*Berliner Tierarztliche Wochenschrift*, November 26th, 1903, page 723), are the same. Eber, of Leipzic, also tested two immune animals from Von Behring's laboratory; one was inoculated intravenously, and in the eye with bovine tuberculosis, and then intravenously with human; the other with human bovine and avine material intravenously. Both remained immune whereas a control subject that was killed nine months afterwards showed, on *post-mortem* examination, extensive lesions. The immunised

animals did not react to tuberculosis, but no *post-mortem* examination was made. Hutyra (*Beitrage zur experimentellen Therapie*, vol. ix., 1904) relates some most interesting experiments showing that although protected animals have high power of immunity, they cannot resist very large doses of virulent material, and that in them subcutaneous inoculation only produces local effects; whereas with unprotected animals they are general.

The method has been carried out on a large scale in Central Europe—in Marbourg, Mecklenbourg, Prussian Poland, Hesse, Austria, and Hungary; and Von Behring has collected the results of about 10,000 cases. These have not yet been published, but, from certain previous ones ("*Caspar Deutsche Tierarztliche Wochenschrift*," 1904, page 811) appear to show certain difficulties and drawbacks.

Saas, Marks and Casper point out that certain of the inoculated animals showed tuberculous lesions that could only be attributed to the vaccine. In one experiment of Marks' four calves out of seventeen were infected, while the same caused no accident in seventeen others on a neighbouring farm, and Casper reports three similar in Silesia; and, according to Streilinger, the tuberculin test on sixty-seven vaccinated calves gave twenty-eight per cent. reactions.

Romer's hypothesis that the lesions are due to infection previous to vaccination will not bear examination. There can be no doubt that "Jennerisation" (at least with certain vaccines) is capable of causing chronic tuberculosis, and as Schweinitz and Schroder justly remark it is necessary to know exactly how long the human tuberculosis injected into the ox remains active. Furthermore, even if vaccination only causes slight lesions that do not affect the health of the ox, it is extremely dangerous to propagate human virus which is much more virulent than ordinary bovine in animals that are used for human food.

The result can be summarised:—

(1.) Calves can be vaccinated against bovine tuberculosis by various processes, especially by the intravenous injection of human material.

(2.) The practical value of the method cannot be determined until the statistics obtained from different countries are published.

(3.) It is not without danger.

(4.) The method requires to be considerably improved in its *technique*.

(*Revue Générale de Médécine Vétérinaire*, December 15, 1904.)

THE SICK HORSE IN PEACE AND WAR.

Abstract from a Lecture given

BY LIEUT.-COLONEL J. A. NUNN, C.I.E., D.S.O., DEPUTY DIRECTOR-GENERAL, A.V.D.,

At the Royal United Service Institution, Whitehall, Tuesday, November 15, 1904.

The Right Hon. the EARL OF DONOUGHMORE, Under-Secretary of State for War, in the Chair.

WHEN I was first asked by your Secretary to read a paper before the members of the Royal United Service Institution I was somewhat at a loss to find a subject, as unfortunately the matter of Army horses has of late years been prominently before the public, and thinking

that it was played out I commenced one on the camel for military purposes. A little reflection, however, showed me that this was a creature in which a limited number only had an interest, and that although but little is known about him, it was best for me to stick to the horse.

Although much paper and ink have been used up in connection with the horse and the South African war, all that has been said and written has been about his selection and purchase as a remount and his feeding and management when in health. On these matters I refrain from touching, as the majority of you know, or, at all events, think you know, as much and more than I do. What I propose to discuss is the best, quickest, and cheapest way of making the Army horse fit for work again after the soldier has, either from ill-luck or ill-management, rendered him *hors de combat.*

There has been a certain amount of controversy as to who is the best qualified to select horses for the Army, and who is best qualified as to the direction of their management in health, military and civil ideas differing, but it is generally conceded that when sick or incapacitated his care should devolve on a veterinary surgeon till such time as he is again restored to usefulness. To use a homely simile, the housewife, when her tin kettle has a hole in it, seeks out a professional gentleman called a tinker, who by his skill restores it to usefulness. In many cases the good dame flatters herself that she is a first-rate judge of tin kettles and their management, and indeed may go so far as to inform her professional adviser that she is quite as capable of mending them as he is, but singular to say, she carefully refrains from experimenting on her own property. I have noticed the same as regards Army horses, but not with other animals, such as oxen and swine, or, indeed, horses that are private property.

In early times, in the case of human beings, the barber who shaved them acted as surgeon, and with horses the blacksmith who shod them. The first arrangement is a matter of bygone history, but, unfortunately for the horse, the latter notion still lingers in England. How it can prevail it is hard to say, for to my mind it is as reasonable to expect the man who makes the soldier's boots to be qualified to treat him in sickness as the man who makes the horse's shoes to be able to treat him. Both the bootmaker and the blacksmith are artisans—skilful and excellent workmen if you will—but nothing more.

[A detail of the history of the Colleges and rise of the profession is omitted.]

In consequence of the enormous losses amongst Army horses, the Government about the end of the eighteenth century determined to provide them with proper medical treatment, and a committee of general officers was assembled to consider the question. As a result of their deliberations an order was issued, dated May 24th, 1796, in which it was laid down that a person who had been properly educated at the Veterinary College should be appointed veterinary surgeon to each cavalry regiment.

The first appears to be a Mr. John Ship, who was posted to the 11th Light Dragoons (now 11th Hussars) in June of that year, but in the following August Professor Coleman was appointed Principal Veterinary Surgeon of the Cavalry and Senior Veterinary Surgeon to the Ordnance, although he still retained his position as Principal of the London Veterinary College. His duties were to nominate candi-

dates for commissions, to inspect all cavalry horses when called upon to do so, to act as consultant with regimental veterinary surgeons when required, and keep them posted up in the latest discoveries and advancements. He also held a contract to supply all the necessary medicines and instruments.

The value of the step became at once apparent. Glanders, of which military stables were hotbeds, became in a very short time extinct through the introduction of a proper and rational system of hygiene, and the death-rate within less than two years diminished by fifty per cent. Coleman also introduced a rational system of shoeing with even better results, and by 1802 there was a qualified veterinary surgeon with each cavalry regiment, besides the Royal Artillery and the Royal Waggon Corps. A report issued in 1809 by the Commission of Military Inquiry on the Army Veterinary Surgeons says: "Their appointment had been productive of much benefit to the Service from their superior information, and from the great improvement made in the shoeing since the veterinary system was instituted."

Up to 1881 the veterinary surgeon was a regimental officer, but in that year the service was organised into a special department, all regimental appointments, excepting those of the Life Guards and Royal Horse Guards, being abolished, the officers being placed on one seniority list and roster for foreign service, and a special uniform adopted. Veterinary surgeons were simply attached to cavalry regiments and other units as their services might be required, and in England this system still remains in force.

The state of things is anomalous, and gives rise to endless confusion. The veterinary surgeon is only attached to the unit, but does not belong to it, whereas the men who are his assistants and act as nurses and dressers do, and for their services he must apply to the officer commanding the unit, as these men are looked on first as soldiers, and can be taken for all sorts of military duty. I am sorry to have to say so, but I have in the course of my career more than once distinctly traced death through the attendant to whom I had given instructions being taken away from a sick animal to perform some other duty, such as standing sentry or carrying coals, and the case being neglected the result was fatal.

In time of peace this system works indifferently well, but in war it has invariably broken down, and in my opinion always will do so, the latest example being in South Africa. Hospitals for the treatment of the sick and depôts for the rest and recovery of convalescents have to be formed, and for the attendants for the service of these units have to be indented upon.

Now, it is not everyone, either soldier or civilian, who is by temperament or by nature fitted to nurse a sick animal, and those that are men with intelligence and of special ability, and naturally the commanding officer of a unit is not going to send away his best men just at a moment when above all others he requires them. The result, "as I am painfully aware," is that on service all the most undesirable men, both morally and physically, are drafted into the veterinary hospital for the unfortunate veterinary surgeon and almost more unfortunate patients to put up with as best they can.

Many of these men, even if willing and capable of instruction, are ignorant of the very rudiments of nursing, and others, as I have said,

are undesirables sent to get rid of them out of their units, and these have to be taught amid all the pressure of a campaign. Furthermore, there is a considerable amount of clerical work, accounts and correspondence in connection with a hospital, for which the veterinary surgeon is responsible. In the regulations clerks are shown as being allowed, but again these are men provided temporarily on loan by some unit, and likely to be withdrawn at any moment. These accounts and correspondence are somewhat complicated, and my experience is that the men sent to me as clerks are ignorant about them, and it has ended in my having to do them myself, unless I was ready to meet deficiencies out of my own pocket. This I have never been ready to do, and never will be, and the result has been that my time has been chiefly taken up doing the work of a 30s. a week clerk instead of my legitimate professional duties, whatever time there was to spare being devoted to trying to teach dressers and attendants the work they should have been fully acquainted with. To make matters worse, as soon as these men began to be of some use they were liable to be recalled to their units, a fresh lot sent, and the whole of the heart-breaking process again gone through *de novo*.

The home system being recognised in India as being so bad was done away with in 1884, and the station hospital one introduced. In that country in every cantonment there is a central or general hospital for all animals, with branch ones where necessary, and to these horses and other animals are sent when sick, treatment in the regimental lines being prohibited. In fact, when a horse becomes useless and unfit for work the troop or battery commander is relieved of the burden of him, and he gets rid of him until he recovers again. The central hospital is furnished with the necessary appliances, and a proper staff of veterinary assistants, dressers, grooms, and clerks, under the control of the veterinary officer, who is responsible for them and the general care and welfare of the sick, and in addition he acts as sanitary officer, making an inspection of each unit in his district at regular intervals, bringing matters that he thinks require looking into to the notice of the proper authorities.

The system in India has worked well, and stood the test of twenty years and several campaigns—Chitral, Tirah, Somaliland, and South Africa, to which country two field veterinary hospitals were sent from India fully equipped in every respect. These were universally praised, and two more asked for, and, indeed, it is not too much to say that at one critical period of the war they saved the situation. They proved to be capable of a large expansion, each section, of which a complete hospital contains two, being enlarged till it practically became another whole one in itself. The Indian field hospitals, I should say, are chiefly manned by natives, specially engaged and instructed for the purpose, forming part of the veterinary establishment.

A word must be said to explain what is meant by an Indian veterinary assistant. These men are natives who have received a training at one of the Indian veterinary colleges which exist at Bombay, Calcutta, and Lahore. The course of instruction lasts for three years, and three stiff examinations have to be passed before the certificate of veterinary assistant can be obtained. At Bombay and Calcutta the lectures and instruction are given in English; at the Lahore College, of which I was principal for eight years, in Hindustani,

and before a pupil was admitted as a student he had to pass an educational examination. I insisted on the middle school standard of the Punjab Educational Department, consisting of reading and writing from dictation, grammar, and simple rules of arithmetic up to fractions, all in the vernacular.

The students are civilians sent to the colleges by the various local authorities, such as district boards, municipal committees, authorities in native States, and soldiers from the Native Army, specially selected and sent by the Military Department to be educated. Many of the civilians are employed, under the Indian Civil Veterinary Department, in the work of suppressing cattle diseases, and others obtain employment all over the East, and some enlist in the Indian Army. I have sent men to China, Borneo, Straits Settlements, Persia, and East Africa, and a large number, "over a hundred," were, I believe, employed during the war in South Africa.

I should like it to be fully understood that these men are not horse-shoers, as the Eastern, wiser than we are, separates the two callings; in fact, in the social scale of village life the *salutrie* is looked upon as a superior, the *nail bund*, or blacksmith, as an inferior service. Some years ago an ill-advised attempt was made to combine the two callings, but, as need hardly be pointed out to anyone acquainted with India, it was foredoomed to failure. These veterinary assistants are valuable servants of the State in their proper position, and are competent to attend to and treat sick animals under professional supervision. Unfortunately attempts have been made to use them instead of veterinary officers, leaving them to act on their own initiative and responsibility, and without exception the results have been disastrous.

Having given this outline of the Indian Station Veterinary Hospital, I will now briefly touch on what I consider should be the plan adopted in this country and the colonies.

I look on the injured horse that is not able to do his work as an encumbrance and a nuisance to the unit both in peace and war, and arrangements should be made to put him out of sight till he is cured, another workable animal being at once supplied in his stead. The arrangement should be such as to insure the cure of the animal in the shortest space of time, for not only are his services required urgently in time of war, but he is also costing money every day he is non-effective—"eating his head off." As has been proved over and over again, it is impossible to treat any but the most trivial injuries on service in the lines of a unit, and, furthermore, that if the animal at once receives attention he may be back at his duty in a few days, whereas, if neglected, he may be incapacitated for weeks if he has not to be destroyed, and there were some ghastly examples of this from sore backs in South Africa. My contention therefore is this, that every horse on service that is incapacitated from carrying his rider or drawing his load should be in a hospital, and his place should be filled up at once with a workable animal.

This system is in force in the Japanese Army; an article describing it and the *etappen* system of working their transport that appeared in the *Times* of August 26th is well worth careful study. Their loss up to date appears to have been only 6 per cent., a painful contrast to the hundreds of horses sacrificed in South Africa, where one regiment alone expended 3,750 horses in thirty months, or a horse for every three-and-a-half miles travelled over.—*Vide* article on "The Wear and

Tear of Horses during the South African War," by Lieutenant A. S. Head, *Journal of Comparative Pathology and Therapeutics*, vol. xvi., p. 299, 1903.

The system of appointing a veterinary officer to each cavalry regiment or unit is wasteful in the extreme, for, as I have pointed out, on service the condition of things is such that he cannot treat a sick animal if there is anything serious the matter with him, and the performance of an operation in the lines of a regiment in the field is almost out of the question. A veterinary surgeon as sanitary officer to a collection of units, and to determine what disabled animals should be sent to the field hospital, is, in my experience, sufficient in the fighting line; the place their services are required and are useful is in the rear, from where, in cases of urgency, such as after a general engagement, assistance can be despatched to the front.

In time of peace the saving in equipment alone would be considerable, one set of apparatus only being necessary, whereas now a separate one is required for each unit hospital. On the matter of efficiency and the welfare of the patients it is needless to enter; it must be obvious to anyone that skilled nursing must be better than the present makeshift arrangement.

In time of peace all animals should be sent to the central hospital that require any special or prolonged treatment, such as operation cases, the branch ones only being used for trivial or emergent ones, or in the somewhat rare event of it being impossible to move the patient. It should be under the charge of a senior veterinary officer with one or more juniors, and should be provided with the necessary *personnel* of the Army Veterinary Corps men, comprising clerks, compounders, dressers, packers, cooks, servants, blacksmiths, and artificers, &c., together with the necessary surgical equipment and apparatus.

These men would form the nucleus of a field veterinary hospital on mobilisation, *their place being taken by others on the Reserve*, and would accompany it on service. The field equipment should be kept ready and stored near at hand, and the senior officer who would accompany the hospital into the field be held responsible for its up-keep and efficiency. The Indian plan is that the equipment is laid down in every detail and kept in readiness; what, if I may use the term, are "technical" stores, such as medicines, instruments, and special apparatus that require a specially skilled person to look after them, being stored in the hospital under the custody of the veterinary officer; the ordinary military articles, such as tents, picket ropes, &c., being in charge of the department responsible for such things, but obtainable at once on requisition, together with the necessary transport. This plan has stood the test of time, and an Indian hospital has been placed on the train complete in all its details in less than thirty-six hours after the order to mobilise has been given.

The number of veterinary officers in South Africa during the war was only forty-two, although every available one was sent there; indeed, at one period there were only thirteen left in the United Kingdom. These proved to be utterly inadequate to cope with the situation, and were supplemented by 281 civil practitioners, in addition to about seventy others employed in purchasing remounts, embarking horses, &c., so that from first to last about 350 extra men were engaged in one duty or another. I give these figures to show the necessity of taking steps to form a reserve, as at present there is

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none in existence, with the exception of a few retired officers whose services could be utilised, but from physical unfitness and other causes these are very limited in number.

In the Auxiliary Forces there are eighty-two veterinary officers, most of whom have a considerable knowledge of military routine, and whose services, if properly organised, would be of the greatest value, many of them being men of high ability and standing in their profession. Of course, some in an emergency would not be available, as they would be required with their own corps, but a large number would be.

I also think that an effort should be made to form a Volunteer Veterinary Corps from the students of the different veterinary colleges, officered by their own professors and teachers, like the Volunteer Medical Corps. In the South African War the value of such a body of auxiliaries would have been incalculable, consisting, as it would, of young, active men with a knowledge of medicine and horse management, and who, being educated, intelligent gentlemen, could be placed in charge of others and in positions of trust and responsibility. A leaven of half-a-dozen such in a large hospital would be a godsend, as they could be placed in authority over the subordinates, being given the necessary temporary rank to insure their orders being obeyed.

A company might be easily raised at each veterinary school and trained and exercised at some convenient military centre, which would not only give students an insight into certain practical details of their profession which would be of use to them hereafter, but would no doubt give some a liking for military life, and determine them to adopt it. This alone is worth considering, as at the present moment the Army Veterinary Department is in a depleted condition, and service in it is the reverse of popular in the veterinary profession.

The question of obtaining veterinary surgeons for the Army is one that has to be considered, as at the present moment this department is 21 per cent. below its authorised peace establishment, and, as I have shown during the South African War, it had to be increased eight-fold by the engagement of civilian practitioners who, from patriotic motives, came forward and offered their services. They might do so again in an emergency, but this as a source of supply is a precarious one, and in certain cases was not very satisfactory.

There are several causes to account for the lack of candidates for commissions in the Army Veterinary Department. For some years past the veterinary profession has been dissatisfied with the pay prospects and general conditions offered by a military compared to a civil career, few coming forward, and fewer still being the best and most promising students from the colleges, as, in the words of one man, "The Army is not good enough." A new warrant improving the prospects of the veterinary service was brought out in October, 1903, since when there has been a certain number of suitable candidates, and perhaps in the future there may be more; but it is not reasonable to expect that, after many years of neglect, the service will be righted in a few months' time, especially as there is a stumbling-block in the way in the shape of service in India. Most veterinary officers have to pass a very large portion of their time in that country, and in some fashion their pay and allowances are so calculated that the majority of the junior ranks are out of pocket. For instance, a

ieutenant in India receives a total emolument of £339 4s., at home £393 10s. 4d.; a captain £381 12s. in India, £446 2s. at home, and so on. This inequality of salary is a very active factor in deterring candidates from coming forward, as it is well known that the pagoda-tree has been shaken bare, and that the cost of living is the same as at home.

Whether the future supply of candidates will be sufficient to fill up vacancies is a moot point. The whole course of study has been changed from what it was in bygone days, and before a young man can enter his name on the books of one of the colleges as a veterinary student he must pass an educational examination, the nature and conditions of which will be best understood if I read the extract from the bye-laws of the Royal College of Veterinary Surgeons relating to it.

[The by-law relating to educational certificates and the matriculation examination is omitted.]

This educational examination, although not technically, is to all practical purposes up to the standard required by the General Medical Council for registration as a medical student, and in a short time they will be absolutely identical. I put particular stress on this point, viz., that if a boy is sufficiently well educated to become a veterinary student, he can, if he likes, become a medical one, as it has great bearing on the argument I am about to put forward.

Having entered as a student at one of the veterinary colleges and paid his fees, a four-year course of study has to be gone through, and an examination passed at the end of each year, failure meaning being put back for about six months. The syllabus of subjects is as follows:—

[The lists of subjects for examinations A, B, C, D, are omitted.]

I have given this somewhat extensive list at length, as my experience is that, as a rule, the public are utterly ignorant as to the course of study that has to be gone through before admission as a member of the Royal College of Veterinary Surgeons. Only a week or two ago, a gentleman holding a high appointment in the Indian Civil Service consulted me about his son, whom he had intended putting into either the Army or Indian medical services, but had come to the conclusion that the boy was too dull to be able to obtain a medical qualification, and therefore he intended to make him a veterinary surgeon and put him into the Army. On showing him the syllabus I have just read to you, he expressed his surprise, saying he thought the whole thing could be done in eighteen months or two years, and also gave his opinion that there was but little difference between it and what was wanted to obtain a medical qualification, except that for the latter the curriculum was one year longer, viz., five instead of four years.

I think most persons who are qualified to judge will agree that if a boy has brains enough to get a veterinary qualification, he has enough to get a medical one.

The matter of expense in entering the two professions is one that requires some notice. Of course, an M.D. degree from a university costs much more than a veterinary diploma; but it must be remembered that there are other registrable medical qualifications, and it would cost very little more, if any at all, to obtain one in Scotland or

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Ireland than a veterinary one in London, living being cheap in those countries. We therefore now arrive at the fact that if a young man is educated enough and smart enough to obtain a veterinary qualification, that he can obtain a medical one with one year's extra study and a very small extra outlay.

The majority of students who now enter the veterinary profession do so with more or less assured prospects in civil life, and for reasons that are outside the scope of this paper the numbers are not so large as formerly. Some years ago a number of young men, the sons of retired officers, professional men, and such persons, were educated with the sole object of entering the Army Veterinary Department, as it could be done cheaper than any other branch of the military service. Scarcely any preliminary educational tests were required; the course of study only lasted two years, and was not very exacting. But all this has changed, and this class of student is no longer in existence.

It seems to me that the dearth of candidates for commissions in the Army Veterinary Department is simply one of supply and demand, and if sufficient value is got for time and money expended, I am—whichever way you like to put it—blessed or cursed with an absence of incumbrances, but if I had sons, and one of them expressed a wish to enter the Army in a department and suggested the veterinary one, as a business man I should reckon out the cost, and what return would be got for the expenditure of his time and my money.

As I hope I have shown, I would see that with a very little more expenditure of both my son or nephew could become a medical man, and I certainly should advise him to turn his attention to the medical instead of the veterinary service as the most remunerative: the Director-General and Deputy-Director-General getting respectively £2,000 and £1,500 per annum, and other grades in proportion, whereas in the veterinary service the Director-General and Deputy-Director-General receive £1,200 and £800 per annum, and other grades in proportion.

This, gentlemen, is, to my mind, a somewhat difficult problem to overcome, as one branch of the public service outbids the other, and it amounts to the aspirant for military honours saying: "I am sharp enough to be able to enter either the medical or veterinary military service; one will take me a little longer, and perhaps cost me a little more than the other, but the return for my time and money expended is 50 per cent. more in one than the other." I should say that, if the young man or his people had an ounce of common-sense in their heads, there need be no hesitation in saying which horse they will put their money on.

I must thank you, gentlemen, for the consideration you have shown me and the attention you have given to a somewhat dry and disjointed paper. In the first part I have purposely avoided entering into details and minutiæ in the reforms I have suggested; and in the concluding portion I have made no suggestion as to obtaining veterinary surgeons for the Army. My object has been to bring forward a certain general principle, and to get the benefit of your opinions as to a remedy; for, in vulgar parlance, I have come here with the object of sucking your brains.

Below our readers will find the continuation of a series of Original Articles from the pen of Lieut.-Colonel Nunn, on "Veterinary Toxicology." It is expected to publish these articles in book form at the conclusion of the series.

GASES AND VAPOURS.

BY LIEUT.-COLONEL J. A. NUNN, F.R.C.V.S., F.R.S.E., C.I.E., D.S.O., BARRISTER-AT-LAW, DEPUTY DIRECTOR-GENERAL ARMY VETERINARY DEPARTMENT.

(*Continued from p.* 111.)

Toxic doses.—Kaufmann gives the poisonous dose of absolute alcohol as 50 to 150 grammes horse, 100 to 300 ox, 30 to 60 sheep and pig, and 1 to 10 dog. Hutwiz found that 8 oz. absolute alcohol killed a horse in ten minutes, but 4 to 6 oz. was not fatal. Dr. Percy found that 6 oz. injected into the stomach of a dog caused death in an hour and ten minutes, and that if the œsophagus was ligatured so as to prevent vomiting 2 oz. caused death in half an hour. Dr. Harley found that half an ounce with the same quantity of water injected into the portal vein caused diabetes in the dog in three hours. Dujardin, Braumetz and Audgie found that the following doses per kilogramme live weight injected subcutaneously in the dog caused death in from twenty-four to thirty-six hours.

Methylic alcohol	... ...	7 grammes
Ethylic ,,	... ...	8 ,,
Propylic ,,	... ...	3·90 ,,
Butylic ,,	... ...	2 ,,
Amylic ,,	... ...	1·70 ,,

Post-mortem appearances.—In acute poisoning there is a certain amount of gastro-intestinal inflammation, but not of a very severe degree, the mucous membrane being of a dark-red colour, softened and in places studded over with hæmorrhagic patches, which are sometimes seen in the other organs of the body. The blood is dark in colour, clots are found in the heart and large vessels, and there is congestion of the brain and its meninges, the liver and spleen. In Gamgee's cases blood clots were found in the lateral ventricles and round the cervical portion of the spinal cord. The gastro-enteritis is more marked with impure than pure alcohol.

In chronic poisoning fatty degeneration of various organs is seen, particularly cirrhosis of the liver and that condition termed "nutmeg."

Symptoms.—In acute poisoning, in addition to gastro-intestinal irritation, there is drunkenness, commencing with restlessness, quickened pulse, which is full and hard, and possibly different forms of nervous derangement; but this stage does not last long, and quickly runs on into collapse, with loss of sensibility and power of motion, fall in temperature and stertorous breathing, in which condition death from asphyxia may take place. Abortion is likely to take place in pregnant animals and excitement of the generative organs. Gamgee mentions that when pressed in the axilla the patient would fall, or if the head were inclined to one side would roll over.

Treatment.—To counteract the depressing effects of alcohol, stimulants are indicated, such as camphor, coffee, ether, ammonia, with cold applications to the head, followed by a brisk purgative.

Chemical analysis.—The materials used are the contents of the stomach and intestines, blood, liver and brain, but the analysis must be made without delay, and the material preserved in large-mouthed jars hermetically sealed. If the amount of alcohol present is considerable the usual characteristic smell will be noticed. The material should be cut up into small portions, a small quantity of water added, and then distilled, only the first fifth part of the total being taken for use. This, on being rectified with anhydrous carbonate of potash, will leave a residue of alcohol. It has the characteristic smell and burns with a pale smokeless flame: treated with sulphuric acid and bichromate of potash, it reduces the yellow chromic acid into a green sesquioxide.

With sulphuric and acetic acid it gives off acetic ether with the characteristic smell, and with a trace of iodine and a few drops of caustic potash when heated, small crystals of iodoform are formed.

Medico-legal.—None of these tests, however, can be considered absolute; they will be observed with certain products of putrefaction, and they are valueless without further evidence.

III.—Anæsthetics.

Poisoning by anæsthetics, whether accidentally or maliciously, is rare in the domestic animals, but cases are on record of sulphuric ether, chloroform, chloral hydrate and iodoform having been used.

1.—SULPHURIC ETHER.

Sulphuric ether is a colourless, volatile liquid with a sweetish smell and a burning acrid taste, but slightly soluble in water. Its use as a medicine, whether inhaled or taken by the mouth, may cause poisoning.

It is readily absorbed and eliminated by the breath and different excretions. Like other anæsthetics, it affects the brain and spinal cord, but nothing is known about the way it acts.

The exact toxic dose is not determined, as it varies with different species, individuals, and the state of health, those that are in a debilitated condition or that suffer from heart or pulmonary troubles being much the more susceptible. When inhaled the dose varies according to the amount of air it is diluted with and the length of time it has taken to administer.

The *post-mortem* appearances of an animal poisoned with ether present nothing diagnostic.

The symptoms are those of an extreme degree of anæsthesia, the three phases of excitement, insensibility and resolution rapidly succeeding each other. In the first stage there are disorganised movements—the eyes bright and glistening, pulse and respirations quickened, and great excitement; this is followed by insensibility, the pulse and respirations becoming slower, the first being almost imperceptible, lowering of temperature and deep depression, death taking place from asphyxia or syncope.

Treatment.—Artificial respiration, inhalation of ammonia or acetic acid and galvanism.

Analysis.—This has to be carried out without delay, by distillation as for alcohol at a low temperature, 35° C. The lung and brain are the best material to use, the distillate being recognised by its characteristic smell and burning with a slight amount of black smoke. Ether gives the same chemical reaction as alcohol.

2.—CHLOROFORM.

Chloroform is a colourless, clear, heavy fluid, with a characteristic smell and a sweetish, burning taste. It is soluble in alcohol, ether, benzol, benzine, fixed and volatile oils, and in 200 times its volume of cold water very volatile, boils at 140° to 141·8° Cent. It is not very inflammable, but burns with a sooty flame that is green at its edges. It is largely used as an anæsthetic and is more certain in its action than ether, but more dangerous. It acts in the same manner as ether but quicker. There is no case on record of malicious poisoning of animals with chloroform, as is the case with human beings; it would be too difficult to administer, and cases of death caused by it have all occurred during or after surgical operations. The action of chloroform as an anæsthetic belongs to the domain of therapeutics and will not be entered into. Accidents, however, generally take place from the use of decomposed chloroform in which various gases, particularly chlorine, have formed.

Chemical analysis.—The suspected material, "blood, lungs and brain," is divided into small portions and diluted with distilled water to a thick bouillon.

One portion is put into a still and heated over a water bath to about 106° Fahr., a heavy oily liquid being given off. When treated with an alcoholic solution of potash and a drop of aniline, phenylcarbilimine is formed which has a characteristic repulsive smell.

A second part of the fluid heated to 106° Fahr. with strong potash lye and a drop of napthol B gives a blue colour (Lustgarten's test).

The third portion is placed in a flask with two bent tubes and heated to 104° Fahr. over a water bath; one tube reaches to the bottom of the flask and is connected with a bellows; the other, a short one with a porcelain tube, that is heated to redness by a Bunsen burner. This porcelain tube is connected with a set of Liebig's bulb tubes containing a solution of nitrate of silver. A current of air is blown through the flask by the bellows, which carries the chloroform with it into the hot porcelain tube, where it is decomposed into chlorine and hydrochloric acid, which again decomposes the nitrate of silver into chloride.

3.—CHLORAL HYDRATE.

Chloral is in France used largely as an anæsthetic, and is highly commended for that purpose by M. Kaufmann (*Traité de Therapeutic*, p. 576), as an intervenous injection. He found it act in two minutes, with little or no previous excitement or after effects. Other observers, however, record contrary results, and state that the anæsthesia produced is neither so safe, complete, or lasting as that produced by chloroform or ether, and it has been little used in this country. In small doses it has been used by unscrupulous persons for fraudulent purposes, such as keeping a vicious animal quiet at the time of sale.

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Symptoms.—In large doses insensibility and loss of muscular power, the animal falling in a comatose state, with the pupils dilated. The pulse is at first weak and quick, afterwards slow and irregular, also the respiration. The sphincters are relaxed, and urine and fæces passed involuntarily. There is profuse perspiration.

Winslow, "Veterinary Materia Medica," p. 300, gives four ounces as the toxic dose for the horse, and two to six drams the dog, but instances are recorded of horses receiving that quantity and recovering (*Finlay Dun*, "Veterinary Medicine," 9th edition, p. 356). Kaufmann gives the poisonous dose as—

Small dogs	8 to 12 grammes.
Large ,, ...	10 to 16 ,,
Cat	4 to 8 ,,
Pig	20 to 8 ,,
Horse	200 to 300 ,,

Falck gives the following:

	Intervenous injection.	Subcutaneous injection.	By the mouth.
Rabbit	... 0·35 grammes	... 1·13 grammes	... 1.30 grammes.
Cat	... 0·31 ,,	... 0·40 ,,	... 1 ,,
Dog	... 0·23 ,,	... 1·20 ,,	... 1 ,,

IODOFORM.

Poisoning usually takes place in dogs where wounds are dressed with iodoform, and they are allowed to lick the part. Winslow, "Veterinary Materia Medica and Therapeutics," has seen it in a cow after abdominal section where the pelvis was packed with iodoform gauze.

In acute poisoning there is slight gastric disturbance, loss of appetite, vomiting and constipation, with convulsions alternating with somnolence, coma, and stupefaction; but in some cases, from the very commencement, there is great excitement much resembling rabies. In some cases the pulse is very quick, in others infrequent; the temperature may be high or remain normal. There is disturbance of the respiration, and in some cases albuminuria.

Chronic poisoning resembles chronic iodism, with emaciation of the glands, especially the udder, characteristic eczema, with catarrh of the pituitary membrane, conjunctiva, and those of the larynx and bronchii.

Iodoform is absorbed from the intestine after being formed into an emulsion with the contained fats. In the circulation it is decomposed and iodine set free, which turns into iodides that are rapidiy eliminated by the urine, in which they can be easily detected by the starch test.

Post mortem.—There is fatty degeneration of the liver, myocardium, striped muscles, and in some cases nephritis. The blood is fluid.

Toxic doses, 0·5 grammes per kilogramme live weight when injected into the serous cavities (Potjakow), one to two grammes hypodermically, and one gramme by the mouth. A cow died in thirty-six hours after taking fifty grammes, but ten grammes did no harm to a calf fifty days old (Frohner). Winslow states that one dram will kill a dog 10 lbs. weight.

Treatment consists in eliminating the poison by emetics. There is no antidote, but starch might be given with the object of forming iodide of starch, an insoluble substance.

Chemical analysis.—The suspected material—liver, brain, intestine, and stomach—are distilled, and the distillate, rendered alkaline with soda, is shaken up with ether, which dissolves the iodoform. The ether is evaporated, and the iodoform remains.

The residue is melted in a porcelain capsule with a little soda, and the mass neutralised with nitric acid and water gives the characteristic reactions of iodides, a yellow precipitate with nitrate of silver blue, with a solution of chlorine or starch.

Lustgartin's test can also be used. The residue can be dissolved in a few drops of alcohol, with the addition of phenate or resurcinate of sodium; the resulting mass, with absolute alcohol, gives a deep carmine, Rosolic acid.

Organic Substances.

A. organic acids.

I. carbolic acid.

Both carbolic and oxalic acids have corrosive actions that closely resemble caustics, but they differ from them inasmuch as, in addition, they both exert a special toxic property. Carbolic acid is one of the numerous coal-tar products, and pure; it is in the form of needle-shaped crystals, colourless, or finally brown or red, that melt at 91·5° F. boil at 371° F., and burn with a smoky flame. It has a peculiar penetrating smell and a hot, burning taste. The specific gravity is 1060 to 1066, soluble in water at 60° F. in five to ten parts, and fifteen in cold; freely soluble in glycerine, volatile oils, alcohol, æther, alkaline solutions, and acetic acid.

Wood tar oils and crude creosote are apt to be mistaken for impure carbolic acid, but they are less soluble in water, boil at 212° F., and do not solidify at 40° F.

There are five varieties in general use, the first three being crystals. No. 4 is a pale yellow liquid, containing about 10 per cent. phenol and 90 per cent. creosote. No. 5 is a dark-coloured fluid of uncertain strength. Calvert's disinfecting powder consists of 20 to 30 per cent. carbolic acid, mixed with the refuse of alum works, and M. Dougall's 33 per cent. calcium carbolate and 59 per cent. magnesium sulphite.

Carbolic acid is largely employed for disinfecting purposes as an antiseptic, and for the destruction of parasites, and on this account cases of poisoning by it in the domestic animals are frequent, both by being taken internally and when applied to the skin.

In concentrated solutions it acts as a caustic, coagulating the albumen in the tissues it comes in contact with and turning them white. It is rapidly absorbed into the blood, even through intact skin. It is rapidly eliminated, chiefly in the urine.

Its toxic effects are not solely due to its caustic properties, but what this general action is has as yet not been properly determined. Paul Bert has, however, shown that it is principally localised in the nervous system.

The poisonous dose greatly varies, according to the way it is taken and the degree of concentration. The cat is the most susceptible

animal, also dogs and sheep, accidents from over-dressing or dipping with too strong a dip, being common with them. Some "Veterinary Medicine" give three to four drops per pound live weight as the fatal dose for cats, rabbits, and dogs, and an ordinary dog half to one dram. Dr. Cullen found one dram caused death in about ten minutes, with excitement, dilated pupils, shallow stertorous breathing, and convulsions (*Vétérinaire*, September and November, 1872). Friedburger found that fifteen grams killed dogs in a few hours. Kaufmann gives half-ounce as dangerous, and one ounce as a fatal dose for the horse; but Finlay Dun states that two drams were frequenty given to a donkey without any ill result. In the human being carbolic dressings frequently cause nausea, vomiting, giddiness, high-coloured urine, collapse, and even death is not unknown from absorption.

Post-mortem appearances.—The viscera, their contents, the various organs, blood and urine have the peculiar smell of carbolic acid. When taken by the mouth in a concentrated form, in the mouth, throat, stomach, and intestines are white cauterised patches, with inflammation in the deeper tissue underneath and surrounded by rings of ecchymosis. These appearances are usually well-marked in the abdomen of ruminants. The blood is dark and fluid, the red corpuscules not being altered, and there is effusion and extravasation into the brain and into the lateral ventricles.

The kidneys are congested and inflamed and the urine varies from an olive green to a very dark brown or even black. The lungs are congested and covered with ecchymosed patches. Where death has taken place within twenty-four hours, the smell of carbolic acid pervades the whole body, but if the patient has lived longer it may not be discovered, and if the case is a prolonged one, there probably will be a granular fatty degeneration of the liver, heart, kidneys, and principal parenchymatous organs.

(*To be continued.*)

THE ROYAL INSTITUTE OF PUBLIC HEALTH.

With a view to bringing together the various professions engaged in sanitary work and public health, the Council have arranged that the President of the Royal College of Veterinary Surgeons and the Director-General of the Army Veterinary Department shall be *ex-officio* Vice-Presidents of the Institute; and Professor J. McFadyean, Principal of The Royal Veterinary College, has accepted a seat on the Council.

The Harben Trustees also appointed Professor McFadyean Harben Lecturer for 1904, and his lectures have appeared in this year's numbers of the *Journal of State Medicine*, the official organ of the Institute.

A Congress of the Royal Institute of Public Health is to be held in London from the 19th to the 25th July, 1905, under the presidency of the most Hon. The Marquis of Londonderry, K.G., Lord President of the Council, and will include a section of "Veterinary Hygiene." Professor J. McFadyean, M.B., M.R.C.V.S., Principal of the Royal Veterinary College, has consented to act as president, with Percy S.

Howard, F.R.C.V.S., of Manor Park, Essex; Alfred C. Wild, M.R.C.V.S., of Woking; and E. Lionel Stroud, F.R.C.V.S., of 29, Spring Street, Hyde Park, as hon. secretaries, from whom all particulars can be obtained.

The Institute has recently acquired most convenient premises in Russell Square, and arrangements have been made for a common room for the members, in which tea and coffee can be obtained, and thus facilities will be afforded to the members of a centre for professional and social intercourse.

The annual subscription is £1 1s., which will entitle to all the privileges of membership, including a copy of the Journal monthly and attendance at the Congress.

Full particulars can be obtained from Mr. James Cantlie, M.A., M.B., Hon. Secretary, 19, Bloomsbury Square, London, W.C.

Reviews.

THE CARE OF HORSES. By ADA F. CARTER, assisted by CHARLES CARTER, M.R.C.V.S.L. 111 pages, 54 illustrations. London: George Bell and Son, Portugal Street, Lincoln's Inn.

This little book attempts at "placing a reliable guide in the hands of stablemen, carmen, and others who have the practical care of horses; and, secondly, to assist the owners of horses and ponies by enabling them to check mistakes and shortcomings on the part of those who have the immediate charge of their animals."

The authoress, in setting about this task, has evidently one most important qualification, and that is an innate love of the animal. This is the underlying current that runs through the book, and at all times, when speaking of horse management, gentle methods are invariably advocated. The directions on stable management, harnessing, riding, driving, bitting, &c., are simply and clearly given, and are illustrated by a number of good photographs; but we think the authoress is not very sound on the important items of feeding and watering. Thus we gather that watering in the morning should take place after feeding, and in the evening before feeding, that no water should be given at midday after the morning's work is over—in fact, that the quantity of water given to a horse should be carefully regulated; for though "some horses will not drink immoderately and may safely be left to their discretion; while others, if permitted, will swill and render themselves incapable of work by causing immoderate perspiration and distress of wind." We think Miss Carter will find that in the largest and best-managed studs horses are watered frequently and allowed to drink freely, and the system of watering before feeding is found most successful. To tell the horsekeeper that he is a better judge than the horse of the quantity of water he should drink is far from sound, and may lead to considerable discomfort on the part of the animal.

With this reservation, we can recommend the book for the purpose for which it is intended. G. E. M.

DIZIONARIO FARMACOLOGICO E THERAPEUTICO VETERINARIO. Dictionary of Veterinary Therapeutics and Pharmacy. By DR. JEAN GAMBAROTTA, Turin Veterinary College. 122 pages. 1904. Published by C. Vaccarino and Co., Turin. Price 2 francs.

The book is divided into two portions. The first is an alphabetical list of the various drugs used in pharmacy, with a description of their physical and therapeutic properties, doses for different animals, and the formulæ recommended. There is an appendix on vaccination and sero-therapeutics.

The second part consists of the therapeutics of special diseases that are classified in alphabetical order. Tables are given of the normal temperatures, pulsation and respiration of different animals, gestation and incubation, the dentition of the horse and dog, cat and pig.

The little book contains a fund of information in a condensed and readily available form, and is no doubt of great utility; but, unfortunately, it is in Italian, a language but few members of the profession are acquainted with in England.

Books and Periodicals, &c., Received.

Fortschritte der Veterinär Hygiene, December, 1904; Bulletin Vétérinaire, December, 1904; Revista de Medicina Veterinaria, December, 1904; Deutsche Tierarztliche Wochenschrift, December, 1904; Berliner Tierarztliche Wochenschrift, December, 1904; Revue Générale de Médecine Vétérinaire; Johns Hopkins Hospital Bulletin; Recueil de Médicine Vétérinaire; l'Echo Vétérinaire; Il Nouvo Ercolani; Clinica Vétérinaira; Le Mois Scientifique; American Veterinary Review; Twentieth Report of the Bureau of Animal Industry, 1903, Department of Agriculture, Washington, U.S.A.

Communications Received.

Captain Anthony; Lieut. Tyson; Major E. Taylor; J. Brodie Cresswell, Esq.; Captain McDougall; Captain Briscoe Knight; James Clark, Cupar-Angus, N.B.; J. G. Thomas, Chichester; Professor F. Hobday; Wallis Hoare, Cork; P. Vincent, Grays; Major H. Pease, Lahore; Captain A. Smith, Lahore; P. Connolly, London; J. Varney, Winslow, Bucks; Granville Haskill, Ipswich.

NOTE.—All communications should be addressed to 8, Henrietta Street, Covent Garden, London, W.C. Telephone, 4646 Gerrard. Telegrams, "Baillière, London."

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Illustrations for reproduction should be in good black or dark brown on white paper or card.

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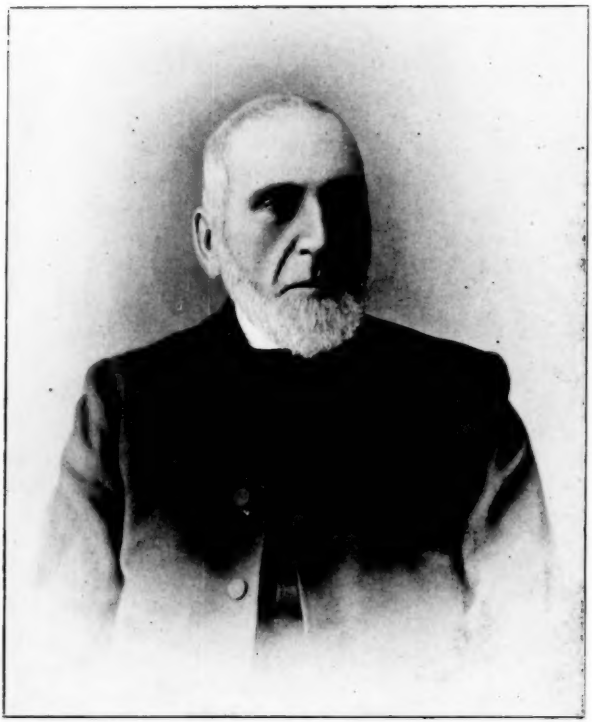

THE LATE Mr. JOSEPH SHEPHERD CARTER, F.R.C.V.S.

Formerly a Member of the Council of the Royal College of Veterinary Surgeons; one of the original founders, and a Past President, of the Yorkshire Veterinary Medical Association.